CONVENTIONAL TRAFFIC POLICING IN THE AGE OF AUTOMATED DRIVING*

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This Article offers a detailed portrait of the potentially negative systemic effects of the growth of autonomous vehicles on racial and economic justice in traffic enforcement and policing involving conventional, human-controlled vehicles. Its contributions are both descriptive and normative. Descriptively, this Article draws on multiple sources (transportation data, market research, and historical evidence) to explain why the growth of autonomous vehicles could give rise to new layers of problems involving pretextual traffic stops and aggressive traffic policing against conventional, human-controlled vehicles. Most at risk are Black, Latinx, and economically marginalized populations that are already vulnerable to overpolicing and overcriminalization in today's driving regime. Normatively, this Article illustrates why values of policing fairness and equality must be considered ex ante and embedded into the early design and development of autonomous vehicles. Consistent with this idea, the analysis examines possibilities for using law and policy to achieve racial and economic justice in traffic enforcement in a mixed-traffic regime where autonomous and conventional vehicles share the road. In so doing, this Article strengthens existing calls for reimagining policing in the area of traffic enforcement and starts a new conversation about the need for these reforms in the advent of autonomous vehicles.

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INTRODUCTION

Traffic stops are a major source of racial and economic injustice in the United States.[1] A long line of scholarship discusses how police discretion in traffic stop settings enables racial profiling on roads and highways.[2] Moreover, empirical literature shows that people of color are not only disproportionately stopped, but also are disproportionately subjected to intrusive police activity during traffic stops (for instance, being questioned, searched, arrested, and subjected to force).[3]

1. *See* Devon W. Carbado, *From Stopping Black People to Killing Black People: The Fourth Amendment Pathways to Police Violence*, 105 CALIF. L. REV. 125, 130 (2017) (discussing racial injustices during traffic stops); David A. Harris, *"Driving While Black" and All Other Traffic Offenses: The Supreme Court and Pretextual Traffic Stops*, 87 J. CRIM. L. & CRIMINOLOGY 544, 545–46 (1997) (same); FRANK R. BAUMGARTNER, DEREK A. EPP & KELSEY SHOUB, SUSPECT CITIZENS: WHAT 20 MILLION TRAFFIC STOPS TELL US ABOUT POLICING AND RACE 25–26 (2018) (discussing how traffic stops have disproportionately targeted and harmed poor communities).

2. *See* CHARLES R. EPP, DONALD P. HAIDER-MARKEL & STEVEN MAYNARD-MOODY, PULLED OVER: HOW POLICE STOPS DEFINE RACE AND CITIZENSHIP, at xv–xvi (2014); Devon W. Carbado, *(E)Racing the Fourth Amendment*, 100 MICH. L. REV. 946, 977 (2002); Carbado, *supra* note 1, at 130; Devon W. Carbado & Cheryl I. Harris, *Undocumented Criminal Procedure*, 58 UCLA L. REV. 1543, 1544 (2011); Angela J. Davis, *Race, Cops, and Traffic Stops*, 51 U. MIAMI L. REV. 425, 427–28 (1997); Samuel R. Gross & Katherine Y. Barnes, *Road Work: Racial Profiling and Drug Interdiction on the Highway*, 101 MICH. L. REV. 651, 655 (2002); Harris, *supra* note 1, at 546; Kevin R. Johnson, Essay, *How Racial Profiling in America Became the Law of the Land:* United States v. Brignoni-Ponce *and* Whren v. United States *and the Need for Truly Rebellious Lawyering*, 98 GEO. L.J. 1005, 1039 (2010); Tracy Maclin, *Race and the Fourth Amendment*, 51 VAND. L. REV. 333, 333 (1998); David A. Sklansky, *Traffic Stops, Minority Motorists, and the Future of the Fourth Amendment*, 1997 SUP. CT. REV. 271, 326–27; Anthony C. Thompson, *Stopping the Usual Suspects: Race and the Fourth Amendment*, 74 N.Y.U. L. REV. 956, 974 (1999).

3. *See, e.g.*, BAUMGARTNER ET AL., *supra* note 1, at 12; Emma Pierson, Camelia Simoiu, Jan Overgoor, Sam Corbett-Davies, Daniel Jenson, Amy Shoemaker, Vignesh Ramachandran, Phoebe

Our driving system, however, is on the verge of major change, and it is uncertain whether racial and economic injustices that stem from traffic stops will worsen.[4] Several automotive manufacturers and high-tech companies are raising and spending billions of dollars to develop autonomous vehicles (defined in this Article to refer to highly automated or fully autonomous vehicles)[5] for

Barhouty, Cheryl Phillips, Ravi Shroff & Sharad Goel, *A Large-Scale Analysis of Racial Disparities in Police Stops Across the United States*, 4 NATURE HUM. BEHAV. 736, 738 (2020); Robin Shepard Engel & Jennifer M. Calnon, *Examining the Influence of Drivers' Characteristics During Traffic Stops with Police: Results from a National Survey*, 21 JUST. Q. 49, 63 (2004); Wendy C. Regoeczi & Stephanie Kent, *Race, Poverty, and the Traffic Ticket Cycle: Exploring the Situational Context of the Application of Police Discretion*, 37 POLICING 190, 192–93 (2014); Sunghoon Roh & Matthew Robinson, *A Geographic Approach to Racial Profiling: The Microanalysis and Macroanalysis of Racial Disparity in Traffic Stops*, 12 POLICE Q. 137, 137 (2009); Stephen Rushin & Griffin Sims Edwards, *An Empirical Assessment of Pretextual Traffic Stops and Racial Profiling*, 73 STAN. L. REV. 637, 725 (2021).

4. *See* Mustapha Harb, Amanda Stathopoulos, Yoram Shiftan & Joan L. Walker, *What Do We (Not) Know About Our Future with Automated Vehicles?*, 123 TRANSP. RSCH. PART C 102948, Feb. 2021, at 1, 2 ("Today's automotive industry is witnessing unprecedented technological change. A study by Intel (2017) projected that the automated vehicles (AV) industry will be worth $7 trillion by 2050."); Darja Topolšek, Dario Babić, Darko Babić & Tina Cvahte Ojsteršek, *Factors Influencing the Purchase Intention of Autonomous Cars*, 12 SUSTAINABILITY 10303, Dec. 2020, at 1, 1 ("Technology in motor vehicle manufacturing and performance is developing rapidly, focusing many of the latest innovations on automatic self-driving or autonomous cars."); *see also* Katherine Shaver, *City Planners Eye Self-Driving Vehicles To Correct Mistakes of the 20th-Century Auto*, WASH. POST (July 20, 2019, 9:00 AM), https://www.washingtonpost.com/transportation/2019/07/20/city-planners-eye-self-driving-vehicles-correct-mistakes-th-century-auto/ [https://perma.cc/8RL9-JMMR (dark archive)] (describing that with autonomous vehicles "[n]ot since the Model T replaced the horse and buggy have transportation and cities faced such extensive transformation").

5. The National Highway Traffic Safety Administration ("NHTSA") has identified six levels of vehicle automation based on the degree to which a vehicle can operate on its own without driver engagement. *See Automated Vehicles for Safety*, NHTSA, https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety [https://perma.cc/5GW9-P8ZZ]. At Level 0 ("no automation"), the "driver performs all driving tasks." *Id.* At Level 1 ("driver assistance"), the "[v]ehicle is controlled by the driver, but some driving assist features may be included in vehicle design." *Id.* At Level 2 ("partial automation"), the "[v]ehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times." *Id.* At Level 3 ("conditional automation"), the "[d]river is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice." *Id.* At Level 4 ("high automation"), the "vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle." *Id.* At Level 5 ("full automation"), the "vehicle is capable of performing all functions under all conditions. The driver may have the option to control the vehicle." *Id.*

This Article uses the term "autonomous vehicle" to refer to vehicles with high-to-full automation capabilities at Levels 4 or 5. Currently, vehicles with automated capabilities only up to Level 2 are available on the market. Kenneth S. Abraham & Robert L. Rabin, *Automated Vehicles and Manufacturer Responsibility for Accidents: A New Legal Regime for a New Era*, 105 VA. L. REV. 127, 131 (2019) ("Currently, there are not even Level 3 vehicles available for sale."); *see also* Kathleen Walch, *Are All Levels of Autonomous Vehicles Equally Safe?*, FORBES (Dec. 8, 2019, 1:00 AM), https://www.forbes.com/sites/cognitiveworld/2019/12/08/how-autonomous-vehicles-fit-into-our-ai-enabled-future/#2852eb165df9 [https://perma.cc/5TFJ-8PMS (dark archive)] (describing vehicles with Level 2 autonomous capabilities to include "Tesla Autopilot, Cadillac Super Cruise, Mercedes-Benz Drive Pilot, and Volvo Pilot Assist"). Scholars and transportation experts have focused on the jump between Level 3 ("conditional automation") and Level 4 ("high automation") as having the most significant difference

the marketplace.[6] Over forty states have enacted legislation, introduced bills, or initiated executive orders related to autonomous vehicles.[7] With calls mounting for the federal government to take a more active role in creating uniform standards and protocols for autonomous vehicles,[8] in January 2020, the U.S. Department of Transportation released updated policies with new guiding principles regarding autonomous vehicles.[9] It more recently built upon those principles to create a comprehensive plan intended to prepare for the integration of automated driving technologies into the U.S. transportation system.[10]

in overall responsibility for driving-related functions between the driver and vehicle. *See* Abraham & Rabin, *supra*, at 149; Bryan Casey, *Robot Ipsa Loquitur*, 108 GEO. L.J. 225, 246 (2019).

6. Eliot Brown, *Uber Clinches $1 Billion Investment in Self-Driving Car Unit*, WALL ST. J. (Apr. 18, 2019, 9:00 PM), https://www.wsj.com/articles/uber-clinches-1-billion-investment-in-self-driving-car-unit-11555635651 [https://perma.cc/C2VK-AUT3 (dark archive)]; Kori Hale, *Amazon Speeds Towards $1.2 Billion Self Driving Black-Led Car Company Zoox*, FORBES (July 7, 2020, 8:16 AM), https://www.forbes.com/sites/korihale/2020/07/07/amazon-speeds-towards-12-billion-self-driving-black-led-car-company-zoox/#330e3cd91741 [https://perma.cc/F2YC-Q64H (dark archive)]; Daisuke Wakabayashi, *Waymo Includes Outsiders in $2.25 Billion Investment Round*, N.Y. TIMES (Mar. 2, 2020), https://www.nytimes.com/2020/03/02/technology/waymo-outside-investors.html [https://perma.cc/EHU9-2R84 (dark archive)]; *see also* Mark A. Geistfeld, *The Regulatory Sweet Spot for Autonomous Vehicles*, 53 WAKE FOREST L. REV. 337, 341 (2018) [hereinafter Geistfeld, *The Regulatory Sweet Spot for Autonomous Vehicles*] ("Autonomous or highly automated vehicle ('HAV') technology is quickly improving, in part because manufacturers are 'pouring billions of dollars' into its development."); Zia Wadud, *Fully Automated Vehicles: A Cost of Ownership Analysis To Inform Early Adoption*, 101 TRANSP. RSCH. PART A 163, 163 (2017) ("All the major mainstream vehicle manufacturers are known to have an automated vehicle program.").

7. *See Autonomous Vehicles State Bill Tracking Database*, NAT'L CONF. ST. LEGISLATURES (Dec. 8, 2020), https://www.ncsl.org/research/transportation/autonomous-vehicles-legislative-database.aspx [https://perma.cc/MQ2K-7JLE] (providing a searchable database of autonomous vehicle bills that have been introduced in the fifty states and the District of Columbia); *see also* Geistfeld, *The Regulatory Sweet Spot for Autonomous Vehicles*, *supra* note 6, at 339 ("[Autonomous vehicles] have hit a legislative sweet spot in which the commercial benefits of developing a highly lucrative market involve a technology that promises to make our roadways substantially safer.").

8. Joan Claybrook & Shaun Kildare, *Autonomous Vehicles: No Driver . . . No Regulation?*, 361 SCI. 36, 36 (2018) ("Driverless cars are on the road with no federal regulation, and the public is paying the price."); Ashley Johnson, *Congress Needs To Hit the Accelerator on Self-Driving Regulation*, INDUSTRYWEEK (Jan. 13, 2020), https://www.industryweek.com/the-economy/article/21120385/congress-needs-to-hit-the-accelerator-on-selfdriving-regulation [https://perma.cc/W6LL-A2TF].

9. *See generally* NAT'L SCI. & TECH. COUNCIL & U.S. DEP'T OF TRANSP., ENSURING AMERICAN LEADERSHIP IN AUTOMATED VEHICLE TECHNOLOGIES: AUTOMATED VEHICLES 4.0 (2020), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/360956/ensuringamericanleadershipav4.pdf [https://perma.cc/2CF8-DUS8] (providing regulatory policies and other guidance for automated vehicles). The Automated Vehicle 4.0 plan establishes federal principles that consist of three core interests: (1) protecting users and communities; (2) promoting efficient markets; and (3) facilitating coordinated effects. *Id.* at 1.

10. *See generally* U.S. DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf [https://perma.cc/B572-Q3CQ] (providing a comprehensive plan for the integration of automated driving technologies).

Although predictions are complicated by many factors, several experts predict that autonomous vehicles will become increasingly mainstream in the upcoming decades.[11] Some commentators claim that the COVID-19 pandemic is spurring greater enthusiasm for autonomous vehicles and recent consumer survey research lends support to this view.[12] Major companies, including Amazon, Walmart, and DoorDash, are already experimenting with self-driving technology to expand pickup and delivery services.[13]

It is almost certain that when the technology is available for individual consumers to purchase, autonomous vehicles will share the road with conventional, human-controlled vehicles ("conventional vehicles") for some

11. Tracy Hresko Pearl, *Compensation at the Crossroads: Autonomous Vehicles & Alternative Victim Compensation Schemes*, 60 WM. & MARY L. REV. 1827, 1839–40 (2019) (discussing expert predictions that autonomous vehicles will become mainstream in the coming decades); Kurt Forsgren, Dhaval Shah & David Lum, *The Road Ahead for Autonomous Vehicles*, S&P GLOBAL (May 14, 2018), https://www.spglobal.com/en/research-insights/articles/the-road-ahead-for-autonomous-vehicles [https://perma.cc/B3U7-B6XD] (estimating that autonomous vehicles will comprise between ten to fifty percent of vehicle market sales by 2040); Press Release, IEEE, Expert Members of IEEE Identify Driverless Cars As Most Viable Form of Intelligent Transportation, Dominating the Roadway by 2040 and Sparking Dramatic Changes in Vehicular Travel (Sept. 5, 2012), https://www.ieee.org/about/news/2012/5september-2-2012.html [https://perma.cc/48ES-EB6R] (anticipating that autonomous vehicles "will account for up to 75 percent of cars on the road by the year 2040"); Prateek Bansal & Kara M. Kockelman, *Forecasting Americans' Long-Term Adoption of Connected and Autonomous Vehicle Technologies*, 95 TRANSP. RSCH. PART A 49, 49 (2017) (offering a pessimistic prediction that 24% and an optimistic prediction that 87% of the U.S. vehicle fleet will be Level 4 autonomous vehicles by 2045). In addition to personal autonomous vehicle ownership, experts predict that ride-sharing services and taxi-car services will begin to use fleets of autonomous vehicles in the coming decades. *See* Chao Mao, Yulin Liu & Zuo-Jun (Max) Shen, *Dispatch of Autonomous Vehicles for Taxi Services: A Deep Reinforcement Learning Approach*, 115 TRANSP. RSCH. PART C 102626, Apr. 2020, at 1, 1 ("We believe that over the coming decades, ride sharing companies such as Uber and Lyft may aggressively begin to use shared fleets of electric and self-driving cars that could be summoned to pick up passengers and shuttle them to offices and stores.").

12. Jack R. Nerad, *Pandemic Will Move Autonomous Vehicle Development Forward, J.D. Power Says*, FORBES (Aug. 14, 2020, 6:30 AM), https://www.forbes.com/sites/jacknerad2/2020/08/14/pandemic-will-move-autonomous-vehicle-development-forward-jd-power-says/?sh=355182e328c0 [https://perma.cc/3QYD-2XUS (dark archive)]; *2020 Mobility Report*, MOTIONAL (2020), https://motional.com/mobilityreport/ [https://perma.cc/PZP3-D8TD] (presenting results from a survey of 1,000 Americans finding that 62% believe that "self-driving vehicles are the way to the future"). *But see* Topolšek et al., *supra* note 4, at 13 ("Over the short to mid-term, the COVID-19 crisis could delay the development of autonomous driving, due to the lack of investments and safety measures during the pandemic.").

13. Agence France-Presse, *GM and DoorDash To Deliver Food with Self-Driving Cars*, INDUSTRYWEEK (Jan. 4, 2019), https://www.industryweek.com/technology-and-iiot/article/22026938/gm-and-doordash-to-deliver-food-with-selfdriving-cars [https://perma.cc/X5T2-BW5L]; Jay Greene & Faiz Siddiqui, *Amazon Buys Self-Driving Car Firm Zoox, Suggesting a Future of Automated Deliveries*, WASH. POST (June 26, 2020), https://www.washingtonpost.com/technology/2020/06/26/amazon-zoom/ [https://perma.cc/6LHA-6XCL (dark archive)]; Tom Ward, *Walmart Teams Up with Cruise To Pilot All-Electric Self-Delivery Powered by 100% Renewable Energy*, WALMART (Nov. 10, 2020), https://corporate.walmart.com/newsroom/2020/11/10/walmart-teams-up-with-cruise-to-pilot-all-electric-self-driving-delivery-powered-by-100-renewable-energy [https://perma.cc/4AZ8-RS9G].

period of time.[14] Tort scholars have taken the lead in exploring how the growth of autonomous vehicles will render traditional legal frameworks surrounding traffic liability and insurance inadequate and are advancing new paradigms to achieve tort policy objectives for when autonomous vehicles hit the road.[15] Autonomous vehicles, however, will also have major consequences outside of tort law, including for law enforcement and policing.[16]

To date, the issue of police-initiated traffic enforcement against conventional vehicles in a mixed-traffic regime has not been a focus of legal scholarship.[17] Whether the growth of autonomous vehicles will exacerbate racial and economic injustices in traffic enforcement and the policing of nontraffic crime[18] for drivers and passengers in conventional vehicles that remain on the road is largely uncharted territory. This gap in the literature is concerning given that it is unclear how long this mixed-traffic regime will last[19] and traffic

14. Abraham & Rabin, *supra* note 5, at 131 (noting that the rollout of highly automated autonomous vehicles "will not, in one fell swoop, obliterate the sale of 'conventional' vehicles"); Tariq Usman Saeed, Mark W. Burris, Samuel Labi & Kumares C. Sinha, *An Empirical Discourse on Forecasting the Use of Autonomous Vehicles Using Consumers' Preferences*, 158 TECH. FORECASTING & SOC. CHANGE 120130, May 2020, at 1, 1 (describing that private ownership of vehicles will not be obsolete during the "early phase of transitioning to the self-driving era (when roads are expected to contain vehicles with and without human drivers").

15. *See* Saeed et al., *supra* note 14, at 5; Casey, *supra* note 5, at 225; Mark A. Geistfeld, *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*, 105 CALIF. L. REV. 1161, 1161 (2017) [hereinafter Geistfeld, *A Roadmap for Autonomous Vehicles*]; Michael I. Krauss, *Freedom from Control, Freedom from Choice? How Will Tort Law Deal with Autonomous Vehicles*, 25 GEO. MASON L. REV. 20, 22 (2017); Pearl, *supra* note 11, at 1854.

16. Thomas J. Cowper & Bernard H. Levin, *Autonomous Vehicles: How Will They Challenge Law Enforcement*, FBI L. ENF'T BULL. (Feb. 13, 2018), https://leb.fbi.gov/articles/featured-articles/autonomous-vehicles-how-will-they-challenge-law-enforcement [https://perma.cc/T294-SDMN] (noting that the adoption of autonomous vehicles "has significant implications for law enforcement"); Elizabeth E. Joh, *Automated Seizures: Police Stops of Self-Driving Cars*, 94 N.Y.U. L. REV. ONLINE 113, 116 (2019) [hereinafter Joh, *Automated Seizures*] ("The widespread adoption of autonomous cars will have an enormous impact on policing."); Jordan Blair Woods, *Autonomous Vehicles and Police De-Escalation*, 114 NW. U. L. REV. ONLINE 74, 76 (2019) ("All signs indicate . . . that autonomous vehicles will have massive implications for law enforcement.").

17. Joh, *Automated Seizures*, *supra* note 16, at 115 ("While there is growing interest in the general regulation of autonomous vehicles, there remains little discussion about how policing will change when people are no longer driving their cars."); Woods, *supra* note 16, at 76 (noting that compared to tort liability issues, "[m]uch less attention . . . is being paid to autonomous vehicles and policing").

18. For simplicity, this Article refers to "policing" to describe policing of nontraffic crime during traffic stops.

19. Abraham & Rabin, *supra* note 5, at 164 (describing the "period when both CVs [conventional vehicles] and HAVs [highly automated vehicles] are on the road" as "decades-long"). Some experts have argued that autonomous vehicles will fully replace conventional vehicles in the next few decades. *See, e.g.*, Ed Sappin, *Will Self-Driving Cars End the Big Automakers?*, FORBES (Apr. 13, 2018, 9:00 AM), https://www.forbes.com/sites/forbesnycouncil/2018/04/13/will-self-drivingcars-end-the-big-automakers/#7d4baa85356d [https://perma.cc/M7UV-E7DQ (dark archive)] (asserting that eventually private car ownership will be a thing of the past).

enforcement is a persistent source of race- and class-based injustice in the United States.[20]

Filling this gap, this Article explores the police regulation of traffic in a mixed-traffic regime and considers how law and policy can be used as tools to achieve racial and economic justice in a mixed-traffic regime. The contributions of this Article are both descriptive and normative. Descriptively, this Article provides a detailed portrait of the potentially negative systemic effects that the growth of autonomous vehicles could have on already existing race- and class-based injustices in traffic enforcement and policing against conventional vehicles.

The descriptive argument is as follows: In a mixed-traffic regime in which people own autonomous vehicles and police retain their current role in traffic enforcement vis-à-vis conventional vehicles, police regulation of traffic is likely to shift in ways that are more targeted against drivers and passengers in conventional vehicles.[21] With the ability to avoid committing traffic violations, the growth of autonomous vehicles will naturally decrease the extent to which autonomous vehicle occupants come into contact with the police through traffic enforcement.[22] At the same time, structural inequalities along the lines of race and class will create barriers that inhibit the most overpoliced populations in today's driving regime from owning and accessing autonomous vehicles.[23] Race- and class-based injustices surrounding which drivers and passengers in conventional vehicles are stopped and subsequently questioned, frisked, searched, cited, and arrested during traffic stops could worsen.[24] In addition, the growth of autonomous vehicles could give rise to new layers of problems involving pretextual traffic stops[25] and aggressive policing against drivers and passengers in conventional vehicles that further harm people of color and other marginalized communities already vulnerable to overpolicing and overcriminalization in today's driving regime.[26]

This Article draws on multiple sources (transportation data, market research, and historical evidence) to identify three trends that lend support to these points. First, available market research indicates that higher-educated and

20. *See* sources cited *supra* note 2.

21. *See infra* Part II.

22. *See infra* Section II.B.

23. *See infra* Section I.B; David Bissell, Thomas Birtchnell, Anthony Elliott & Eric L. Hsu, *Autonomous Automobilities: The Social Impacts of Driverless Vehicles*, 68 CURRENT SOCIO. 116, 123 (2018) ("Just like previous mobility systems, access to this new technology is likely to be unevenly distributed across classed and racial lines.").

24. *See infra* Sections II.B–C.

25. *See* Elizabeth E. Joh, *Discretionless Policing: Technology and the Fourth Amendment*, 95 CALIF. L. REV. 199, 209 (2007) [hereinafter Joh, *Discretionless Policing*] (defining pretextual stops as "occasions when the justification offered for the detention is legally sufficient, but is not the actual reason for the stop").

26. *See infra* Part II.

higher-earning households will be the most likely initial consumers of autonomous vehicles once the technology is available on the market and becomes increasingly mainstream.[27] Second, transportation data indicate that lower-income households, and especially lower-income households of color, are overrepresented among those who drive older vehicles that lack the newest safety features and technology.[28] Third, history demonstrates that major changes in driving infrastructure (for instance, the construction of the interstate highway system) can shift the spatial and geographic dimensions of policing in racialized and class-determined ways.[29]

Normatively, this Article claims that although autonomous vehicles have promise to produce vast social and economic benefits,[30] the process of reaping those benefits must unfold in a fair and equitable way.[31] As scholars have described, technology can be deployed in ways that reduce disparities and harms for marginalized groups in some policing contexts, while exacerbating those problems in other policing contexts.[32] Rather than considering values of policing equality and fairness from an ex post perspective, this Article argues that these values should be considered ex ante and embedded into the early design and development of autonomous vehicles.[33]

27. *See infra* Section I.B.

28. *See infra* Section I.B.

29. *See infra* Section I.C.

30. Ryan Abbott, *The Reasonable Computer: Disrupting the Paradigm of Tort Liability*, 86 GEO. WASH. L. REV. 1, 42 (2018) (articulating several "revolutionary benefits" of autonomous vehicles); SECURING AM.'S FUTURE ENERGY, AMERICA'S WORKFORCE AND THE SELF-DRIVING FUTURE: REALIZING PRODUCTIVITY GAINS AND SPURRING ECONOMIC GROWTH 8 (2018), https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf [https://perma.cc/YW8G-MH73] ("Significant economic benefits from the widespread adoption of AVs [autonomous vehicles] could lead to nearly $800 billion in annual social and economic benefits by 2050."). *But see* Soheil Sohrabi, Bahar Dadashova, Haneen Khreis, Ipek N. Sener & Johanna Zmud, *Quantifying the Health and Health Equity Impacts of Autonomous Vehicles: A Conceptual Framework and Literature Review*, 22 J. TRANSP. & HEALTH 101120, July 2021, at 1, 2 ("AV's impacts cannot be estimated by empirical studies yet because they are not operating freely on public roads.").

31. *Cf.* Shane Epting, *Automated Vehicles and Transportation Justice*, 32 PHIL. & TECH. 389, 393 (2019) ("Perhaps the most pressing issue that has not received sufficient attention in the literature is how AVs [autonomous vehicles] will affect vulnerable groups.").

32. *See, e.g.*, I. Bennett Capers, *Race, Policing, and Technology*, 95 N.C. L. REV. 1241, 1268–83 (2017) (discussing how technology can be harnessed to deracialize policing); Bennett Capers, *Policing, Technology, and Doctrinal Assists*, 69 FLA. L. REV. 723, 759 (2017) (arguing that police use of technology can play a role in addressing racial profiling); Andrew Ferguson, *The Exclusionary Rule in the Age of Blue Data*, 72 VAND. L. REV. 561, 594–635 (2019) (examining how digital surveillance technologies "could be used to address accountability problems of police violence, racial bias, and unconstitutional practices"); Kristian Lum & William Isaac, *To Predict and Serve?*, 13 SIGNIFICANCE 14, 19 (2016) (discussing how predictive policing "reproduc[es] and magnif[ies]" biases in policing); Hannah Bloch-Wehba, *Visible Policing: Technology, Transparency, and Democratic Control*, 109 CALIF. L. REV. 917 *passim* (2021) (discussing how technology can erode transparency in policing).

33. This point is consistent with what has been labeled a "design for values" approach in ethics and technology literature. *See* Taylor Stone, Filippo Santoni de Sio & Pieter E. Vermaas, *Driving in*

Consistent with this idea, this Article explains that piecemeal constitutional or statutory interventions that limit aspects of police authority during traffic stops will be insufficient to tackle the structural ways in which the growth of autonomous vehicles could exacerbate race- and class-based injustices in traffic enforcement and policing against drivers and passengers in conventional vehicles.[34] Rather, deeper reforms will be needed that reorient the role of police in the traffic space and that narrow relevant gaps which place conventional vehicle occupants at greater risk of police contact through traffic enforcement.[35] Along these lines, this Article provides fresh support for growing calls to remove police from routine traffic enforcement and aligns with broader social movements to reimagine public safety and policing.[36]

Two caveats are useful at the outset. First, questions about the nature and extent of police authority over autonomous vehicles and their occupants are beyond the scope of this Article.[37] It is possible that autonomous vehicles will be policed in ways that differ from conventional vehicles, yet still engender individual and social costs. For instance, the focus of policing autonomous vehicles could shift away from traffic violation enforcement to using the data from autonomous vehicles for surveillance and criminal investigation purposes.[38] These privacy concerns are important, but nonetheless different from the main questions that are the focus of this Article involving the policing of conventional vehicles that remain on the road in a mixed-traffic regime.

the Dark: Designing Autonomous Vehicles for Reducing Light Pollution, 26 SCI. & ENG'G ETHICS 387, 388–89 (2020) (describing how a design-for-values approach "asserts that societal and moral values should be proactively taken into account from the early stages of the design and development process, thus embedding values into the technical system"); *see also* Bissell et al., *supra* note 23, at 121 ("Technologies of transit can bear the cultural imprints of those who developed them and these imprints can be involved in the creation or reproduction of asymmetrical power relations.").

34. Rachel A. Harmon, *Promoting Civil Rights Through Proactive Police Reform*, 62 STAN. L. REV. 1, 1 (2009) (recognizing more generally that "[r]educing police misconduct requires substantial institutional reform in our nation's police departments").

35. *See infra* Part III.

36. *See infra* Part III.

37. For a discussion of police stops on self-driving cars, see generally Joh, *Discretionless Policing*, *supra* note 25. For a comprehensive discussion of surveillance issues in smart cities, see generally Andrew Guthrie Ferguson, *Structural Sensor Surveillance*, 106 IOWA L. REV. 47 (2020).

38. *See* Dorothy J. Glancy, *Privacy in Autonomous Vehicles*, 52 SANTA CLARA L. REV. 1171, 1196 (2012) ("Government agencies, including law enforcement and intelligence agencies, will seek to use personal information from autonomous vehicles to find suspicious individuals for further investigation or to prosecute suspects based on autonomous vehicle data."); Brad Templeton, *Will Networked Self-Driving Cars Become a Surveillance Nightmare?*, FORBES (Aug. 29, 2019, 8:10 AM), https://www.forbes.com/sites/bradtempleton/2019/08/29/well-networked-self-driving-cars-become-a-surveillance-nightmare/?sh=4bdbb7c2612f [https://perma.cc/FF8D-Y4B2 (dark archive)] (discussing police surveillance and self-driving cars); Woods, *supra* note 16, at 84 (discussing how the ability of autonomous vehicles to record data could give rise to new forms of police surveillance and policing strategies).

Second, the analysis in this Article is not intended to argue that the direction of autonomous vehicle technology and the subsequent regulation of traffic will unfold monolithically within and across localities.[39] The technology is likely to be deployed in different and multiple ways in urban, suburban, and rural spaces.[40] Policing also differs within and across cities, suburbs, and rural areas.[41] Even if the growth of autonomous vehicles does not exacerbate race- and class-based injustices in traffic enforcement and policing during traffic stops on conventional vehicles in all localities, it is vital to not lose sight of where and how those negative systemic harms occur.

This Article proceeds as follows. Part I draws on multiple sources, including transportation research, market data, and historical evidence, to examine trends in autonomous vehicle accessibility and demand. Building on that analysis, Part II provides a detailed portrait of the potentially negative systemic effects of autonomous vehicles on racial and economic justice involving traffic enforcement and policing against drivers and passengers in conventional vehicles. Part III then explores potential law and policy reforms for achieving racial and economic justice in traffic enforcement and policing involving conventional vehicles in a future mixed-traffic regime.

39. Experts have brainstormed at least three possible models of autonomous vehicle ownership in the future. *See* Patrick M. Bösch, Felix Becker, Henrik Becker & Kay W. Axhausen, *Cost-Based Analysis of Autonomous Mobility Services*, 64 TRANSP. POL'Y 76, 77 (2018). The first model is a *personal ownership* model. Under this approach, individuals will own autonomous vehicles in the same way that individuals own conventional, human-controlled vehicles today. *Id.* The second model is an *on-demand* model. Under this approach, people will summon autonomous vehicles, similar to how taxis or Uber/Lyft services are summoned today. *Id.* The third and final model is the *car-sharing* model. Under this approach, a certain number of autonomous vehicles will be available for use in lots or garages that a group of people would share and potentially collectively own. *Id.* Of course, it is possible that all three ownership models could coexist in a particular region or locality. Which ownership models are available in a particular locality could also change over time. *See, e.g.*, GEORGE MARTIN, SUSTAINABILITY PROSPECTS FOR AUTONOMOUS VEHICLES: ENVIRONMENTAL, SOCIAL, AND URBAN 120 (2020) ("The consensus position among analysts is that autonomous vehicles will begin deployment in fleets.").

40. BARUCH FEIGENBAUM, REASON FOUND., AUTONOMOUS VEHICLES: A GUIDE FOR POLICYMAKERS 47 (2018), https://reason.org/wp-content/uploads/2018/03/autonomous-vehicles-guide-for-policymakers.pdf [https://perma.cc/3CNL-P96N] ("Autonomous vehicles will be adopted in different ways in different areas. There are at least five major types of land uses: downtown, dense development, campus zone, suburban and rural.").

41. *See* RALPH A. WEISHEIT, DAVID N. FALCONE & L. EDWARD WELLS, CRIME AND POLICING IN RURAL AND SMALL-TOWN AMERICA 188 (3d ed. 2006) (arguing that "rural and urban policing are fundamentally different, particularly in the day-to-day details"); John P. Crank, *The Influence of Environmental and Organizational Factors on Police Style in Urban and Rural Environments*, 27 J. RSCH. CRIME & DELINQ. 166, 166 (1990) (concluding based on the results of an empirical study that "the organizational and environmental dynamics affecting police style vary, at times considerably, between urban and rural departments").

I. AUTONOMOUS VEHICLE ACCESSIBILITY AND DEMAND

This part draws on evidence from multiple sources (including transportation data, market research, and history) to argue that barriers along the lines of race and class will inhibit the most overpoliced and marginalized populations in today's driving regime from initially owning and accessing autonomous vehicles. To establish these points, Section I.A first discusses why personal ownership is a likely model of autonomous vehicle ownership in the future. Section I.B examines likely racial and economic gaps in autonomous vehicle access and demand. Finally, Section I.C discusses potential spatial and geographic consequences of autonomous vehicle growth. The next part of this Article explores the implications of these points for traffic enforcement and policing against conventional vehicles in a mixed-traffic regime.

A. *Autonomous Vehicles and Personal Ownership*

Personal ownership is a very likely model of autonomous vehicle ownership once the technology is available.[42] To begin, there is a strong cultural emphasis on car ownership in the United States.[43] Owning a vehicle has historically been, and still is, a symbol of freedom and success in the United States.[44]

42. *See* Bösch et al., *supra* note 39, at 84 (describing private ownership of autonomous vehicle as "an attractive option . . . as out-of-pocket costs for the user . . . are lower than for most other modes"); Harb et al., *supra* note 4, at 2 (identifying personal ownership of autonomous vehicles as one of "[t]wo main business models [that] are speculated to shape the future of transportation"); Wenwen Zhang, Subhrajit Guhathakurta & Elias B. Khalil, *The Impact of Private Autonomous Vehicles on Vehicle Ownership and Unoccupied VMT Generation*, 90 TRANSP. RSCH. PART C 156, 157 (2018) ("[T]he majority of consumers may still prefer to own a private AV [autonomous vehicle] in the near future."). This does not deny the possibility that different ownership models could coexist in localities. *See* Bösch et al., *supra* note 39, at 77 (discussing personal ownership, on-demand, and car-sharing models of autonomous vehicle ownership).

43. Birgitta Gatersleben, *The Car as a Material Possession: Exploring the Link Between Materialism and Car Ownership and Use*, *in* AUTO MOTIVES: UNDERSTANDING CAR USE BEHAVIOURS 137, 139 (Karen Lucas, Evelyn Blumenberg & Rachel Weinberger eds., 2011) ("The private car . . . can have strong symbolic appeal, because, through years of persistent media advertisement, it is commonly understood and accepted as a symbol that denotes social status, confidence, power and competence."); Elizabeth Rosenthal, *The End of Car Culture*, N.Y. TIMES (June 29, 2013), https://www.nytimes.com/2013/06/30/sunday-review/the-end-of-car-culture.html [https://perma.cc/4 L5W-KW82 (dark archive)] (describing the United States as historically having "one of the world's prime car cultures").

44. Gatersleblen, *supra* note 43, at 139; JEFFREY E. NASH & JAMES M. CALONICO, INSTITUTIONS IN MODERN SOCIETY: MEANINGS, FORMS, AND CHARACTER 192 (1993) ("[T]he car remains a symbol of individual freedom and power."). *See generally* Blaine A. Bromwell, *A Symbol of Modernity: Attitudes Toward the Automobile in Southern Cities in the 1920s*, 24 AM. Q. 20 (1972) (discussing the symbolic representation of the automobile in U.S. southern cities in the 1920s). It is important to note, however, that some scholars have argued that self-driving cars could disrupt the traditional relationship between identity and car ownership. *See* Sarah J. Fox, *Planning for Density in a Driverless World*, 9 NE. U. L. REV. 151, 165–66 (2017) ("A reconceptualization of the human relationship to cars may make it possible over time to encourage more efficient, less land-intensive forms of transportation and help to eliminate reliance on personal ownership of vehicles altogether."); JAMES M. RUBENSTEIN,

Moreover, several manufacturers paving the way for autonomous vehicles to become mainstream envision a future in which individuals can own self-driving cars, especially in less densely populated areas.[45] Fewer options and potentially longer waiting times pose obstacles for on-demand and car-sharing services to replace personal vehicles as the principal mode of transport in less densely populated localities.[46] For these reasons, personal ownership is a practical model for making autonomous vehicles accessible and available in rural and suburban areas that lack robust public transport systems.

B. *Racial and Economic Gaps in Autonomous Vehicle Access and Demand*

Ownership and access to autonomous vehicles will likely be unevenly distributed along the lines of race and class.[47] Several experts predict that when personally-owned autonomous vehicles are first available on the market, they will be highly priced, and accessibility and demand will be similar to that of luxury cars today.[48] At some point, market competition will drive down production and operational costs, making autonomous vehicles more affordable to a greater segment of the general public.[49] When this shift occurs, the

MAKING AND SELLING CARS: INNOVATION AND CHANGE IN THE U.S. AUTOMOTIVE INDUSTRY 308 (2001) (noting that at the turn of the twentieth century, "[o]wning and operating a motor vehicle became a matter of high social status in American culture").

45. *See, e.g.*, Paul Lienert, *GM Sees Custom Designs, Personal Ownership for Self-Driving Cars*, REUTERS (May 10, 2018, 2:28 PM), https://www.reuters.com/article/us-general-motors-selfdriving/gm-sees-custom-designs-personal-ownership-for-self-driving-cars-idUSKBN1IB2T6 [https://perma.cc/4TZZ-ZNL8] (quoting the General Motors' vice president of global strategy stating that personally-owned self-driving cars will be "a big business in the future"); Elon Musk, *Master Plan, Part Deux*, TESLA BLOG (July 20, 2016), https://www.tesla.com/blog/master-plan-part-deux [https://perma.cc/62KW-LYVN] (describing how Tesla's "shared fleet" business model is based on the idea that customers can own autonomous vehicles).

46. *See* David Levinson, *Climbing Mount Next: The Effects of Autonomous Vehicles on Society*, 16 MINN. J.L. SCI. & TECH. 787, 802 (2015) (noting that on-demand autonomous vehicle services "will work better in urban areas than rural areas, as the response time will be shorter and size and variety of the nearby vehicle pool will be greater").

47. Bissell et al., *supra* note 23, at 123.

48. *See* Dorothy Glancy, *Autonomous and Automated and Connected Cars—Oh My! First Generation Autonomous Cars in the Legal Ecosystem*, 16 MINN. J.L. SCI. & TECH. 619, 622 (2015) ("Some predict that only wealthy early-adopters will choose autonomous cars, which initially are likely to be expensive and few in number."); Qi Luo, Romesh Saigal, Zhibin Chen & Yafeng Yin, *Accelerating the Adoption of Automated Vehicles by Subsidies: A Dynamic Games Approach*, 129 TRANSP. RSCH. PART B 226, 237 (2019) ("AVs may be highly priced at the beginning so that the initial AV market potential is restricted.").

49. *See* Randal O'Toole, *Policy Implications of Autonomous Vehicles*, 758 CATO INST. POL'Y ANALYSIS, Sept. 18, 2014, at 1, 4 (discussing various market factors that will pressure manufacturers to sell autonomous cars at affordable rates).

technology will first trickle down to higher-income households that can afford the technology.[50]

Available market research shows that current enthusiasm and demand for autonomous vehicles in the United States is strongest among higher-income and higher-educated households.[51] Experts have identified two factors to explain these trends. First, higher-income earners have greater opportunity costs of time,[52] and therefore, will reap financial benefits from investing in time-saving means of transport, including autonomous vehicles.[53] Second, higher-income and higher-educated earners are more likely to engage in "knowledge work"[54] that cuts across several professions (for instance, research and product

50. JONAH GAMBA, RADAR SIGNAL PROCESSING FOR AUTONOMOUS DRIVING 140 (2020) ("In the beginning, driverless cars would likely be out of the price range of most ordinary people but with mass production, prices will go down in the coming 20 years.").

51. *See, e.g.*, Prateek Bansal, Kara M. Kockelman & Amit Singh, *Assessing Public Opinions of and Interest in New Vehicle Technologies: An Austin Perspective*, 67 TRANSP. RSCH. PART C, Feb. 2016, at 1, 13 (finding from one study that "high-income tech-savvy males, living in urban areas and having greater crash experience have more interest in and a higher [willingness to pay]" for autonomous vehicles); DANIEL HOWARD & DANIELLE DAI, PUBLIC PERCEPTIONS OF SELF-DRIVING CARS: THE CASE OF BERKELEY, CALIFORNIA 18 (2013), https://www.ocf.berkeley.edu/~djhoward/reports/Report%20-%20Public%20Perceptions%20of%20Self%20Driving%20Cars.pdf [https://perma.cc/A2YM-2AFE] (finding from one survey that "[w]ealthier people are more likely to be interested in self-driving cars than those with lower income"); Parvathy Vinod Sheela & Fred Mannering, *The Effect of Information on Changing Options Toward Autonomous Vehicle Adoption: An Exploratory Analysis*, 14 INT'L J. SUSTAINABLE TRANSP. 475, 482 (2020) (presenting study findings showing that "more highly educated individuals (holding a bachelor's degree or above), those having household incomes greater than $100,000 per year, and those individuals whose recent vehicle purchase was a new vehicle had higher probabilities of being *likely* or *extremely likely* to adopt autonomous vehicles"); BRANDON SCHOETTLE & MICHAEL SIVAK, UNIV. OF MICH. TRANSP. RSCH. INST., A SURVEY OF PUBLIC OPINION ABOUT AUTONOMOUS AND SELF-DRIVING VEHICLES IN THE U.S., THE U.K., AND AUSTRALIA 21 (2014), https://deepblue.lib.umich.edu/bitstream/handle/2027.42/108384/103024.pdf?sequence=1&isAllowed=y [https://perma.cc/3X8U-D7KJ] (finding from one survey that "[h]igher levels of education were associated with greater interest by respondents in having self-driving-technology on their vehicle, and being less likely to say that they would not ride in self-driving vehicles").

52. PHILIP MCCANN, MODERN URBAN AND REGIONAL ECONOMICS 124 (2d ed. 2013) ("[P]eople who earn high wage incomes have a high opportunity cost of time, in that the opportunity cost to these people of non-wage activity is high.").

53. Edward L. Glaeser & Giacomo A.M. Ponzetto, *The Political Economy of Transportation Investment*, 13 ECON. TRANSP. 4, 8 (2018) ("[T]he opportunity cost of time spent travelling is proportional to income, so higher incomes increase the benefit of infrastructure investments that reduce travel times."); Ralph McLaughlin, *How Driverless Cars Could Drive Even Deeper Economic Inequality*, FAST CO. (Nov. 6, 2017), https://www.fastcompany.com/40490471/how-driverless-cars-could-drive-even-deeper-economic-inequality [https://perma.cc/WVW8-W3U3] (noting that because of higher opportunity cost of time, "higher income consumers stand to reap greater financial benefits from adopting time-saving modes of transport, such as driverless cars").

54. SUE NEWELL, MAXINE ROBERTSON, HARRY SCARBROUGH & JACKY SWAN, MANAGING KNOWLEDGE WORK AND INNOVATION 24 (2d ed. 2009) (describing that in knowledge work, "knowledge acts as the main input into the work, the major way of achieving the work, and the major output"); *id.* (noting that knowledge work "is traditionally referred to as professional work (e.g., accountancy, scientific and legal work) and more contemporary types of work (e.g., consultancy,

development, architecture, advertising, education, and professional services in law, finance, or consulting).[55] In following the rules of the road, autonomous vehicles will increase productivity for knowledge workers by transforming commute time into potential work time.[56]

Current trends in conventional vehicle ownership and access lend additional support to the idea that lower-income households will be least likely to reap the benefits of autonomous vehicles. Research shows that personal vehicle owners from lower-income households are more likely to own older vehicles that lack advanced safety features.[57] Lower-income individuals are also more likely to drive vehicle models that fail inspections at higher average rates and drive vehicles that have problems serious enough to fail vehicle inspections.[58] These trends suggest that the high cost of autonomous vehicles will pose a major barrier to their adoption in lower-income communities and households.[59]

In addition, many lower-income people live in car-dependent areas without robust public transportation systems, especially in suburban and rural regions.[60] In those localities, car accessibility is essential to get to work and

software development, advertising and public relations)"). Some scholars warn against defining knowledge work "in terms solely of high-skill occupations" and have examined the impact of knowledge work on all industries and professions. *See, e.g.*, BILL LAFAYETTE, WAYNE CURTIS, DENISE BEDFORD & SEEMA IYER, KNOWLEDGE ECONOMIES AND KNOWLEDGE WORK 5 (2019).

55. NEWELL ET AL., *supra* note 54, at 24 ("Knowledge workers typically have high levels of education and specialist skills combined with the ability to apply these skills in practice to identify and solve problems.").

56. McLaughlin, *supra* note 53; *see also* Topolšek et al., *supra* note 4, at 1 (noting that autonomous cars "are also predicted to improve productivity because they will enable people to focus their attention on things other than driving").

57. ROLF PENDALL, EVELYN BLUMENBERG & CASEY DAWKINS, URB. INST., WHAT IF CITIES COMBINED CAR-BASED SOLUTIONS WITH TRANSIT TO IMPROVE ACCESS TO OPPORTUNITY 2 (2016), http://www.urban.org/sites/default/files/publication/81571/2000818-What-if-Cities-Combined-Car-Based-Solutions-with-Transit-to-Improve-Access-to-Opportunity.pdf [https://perma.cc/V3BU-NWB6] ("Low-income households also tend to own older vehicles that often break down."); Ashley Nunes & Kristen Hernandez, *The Cost of Self-Driving Cars Will Be the Biggest Barrier to Their Adoption*, HARV. BUS. REV. (Jan. 31, 2019), https://hbr.org/2019/01/the-cost-of-self-driving-cars-will-be-the-biggest-barrier-to-their-adoption [https://perma.cc/C55V-XZK8] (noting how lower income individuals "are more likely to . . . own older vehicles that lack advanced safety failures").

58. *See, e.g.*, Ryan J. Wessel, *Policing the Poor: The Impact of Vehicle Emissions Inspection Programs Across Income*, 78 TRANSP. RSCH. PART D 102207, 2020, at 1, 1; Nunes & Hernandez, *supra* note 57 (noting how lower income individuals "are more likely to . . . own older vehicles that . . . have lower crash-test ratings").

59. *See* Nunes & Hernandez, *supra* note 57 (discussing how the likely cost of autonomous vehicles raises questions about whether lower income individuals will have access to the technology since they are more likely to own older vehicles with lower crash-test ratings).

60. Dennis M. Brown & Eileen S. Stommes, *Rural Governments Face Public Transportation Challenges and Opportunities*, 2 AMBER WAVES, Feb. 2004, at 11, 11 ("Public transportation serves about 60 percent of all rural counties, including 28 percent with limited service."). Research shows, however, that low-income people and people of color are overrepresented in those who use public transportation in larger metropolitan areas. *See* Sarah Schindler, *Architectural Exclusion: Discrimination and Segregation*

obtain vital goods and services.[61] Although lower-income households and especially lower-income households of color are overrepresented among individuals who lack personal vehicle access,[62] research shows that in the past few decades, there has been a surge in levels of personal vehicle access and ownership in both groups.[63] Most low-income people in the United States currently live in households with vehicles.[64]

C. *Spatial and Geographic Consequences of Autonomous Vehicle Growth*

The growth of autonomous vehicles could have spatial and geographic consequences that further entrench race- and class-based divisions within and across localities. History illustrates how major changes in driving infrastructure can enable new migration patterns in racialized and class-determined ways.[65]

A prime example involves the surge of white suburbanization ("white flight") with the establishment of the interstate highway system in the decades after World War II.[66] In the 1950s, federal subsidization of new highways and

Through Physical Design of the Built Environment, 124 YALE L.J. 1934, 1961 (2015) ("[I]n larger metropolitan areas, low-income people and people of color often rely more heavily on public transportation than people from other groups.").

61. Kelly L. Fleming, *Social Equity Considerations in the New Age of Transportation: Electric, Automated, and Shared Mobility*, 13 J. SCI. POL'Y & GOVERNANCE, Oct. 2018, at 1, 2 ("Low-income families, which are disproportionately people of color, people with disabilities, and rural populations, without access to reliable transportation face increased barriers to basic necessities to succeed in the US, propagating cycles of inequity.").

62. *See* Brown & Stommes, *supra* note 60, at 11 ("Poor rural households are three times more likely than nonpoor rural households to be without a vehicle."); Nicholas J. Klein & Michael J. Smart, *Car Today, Gone Tomorrow: The Ephemeral Car in Low-Income, Immigrant and Minority Families*, 44 TRANSP. 495, 501 (2017) ("[W]e find what prior research has shown: poor, foreign born and non-white families are all considerably less likely to have an automobile than non-poor, US-born, or white families.").

63. Evelyn Blumenberg, *Social Equity and Urban Transportation*, *in* THE GEOGRAPHY OF URBAN TRANSPORTATION 334 (Genevieve Giuliano & Susan Hanson eds., 4th ed. 2017) ("As of 2014, 95% of all adults [in the United States] lived in households with at least one automobile. Nearly 80% of low-income adults now live in households with vehicles, and increase from over 50% in 1960.").

64. *Id.*

65. Robert D. Bullard, *Introduction* to HIGHWAY ROBBERY: TRANSPORTATION RACISM & NEW ROUTES TO EQUITY 1, 4 (Robert D. Bullard, Glenn S. Johnson & Angel O. Torres eds., 2004) ("The disparity of fruits borne by various transportation development projects is a grim story of a stolen harvest with disproportionate burdens and costs paid for in diminished health and life opportunities by poor people and people of color."); Robert D. Bullard, *The Anatomy of Transportation Racism*, *in* HIGHWAY ROBBERY: TRANSPORTATION RACISM & NEW ROUTES TO EQUITY, *supra*, at 15, 19; *see also* Deborah N. Archer, *Transportation Policy and the Underdevelopment of Black Communities*, 106 IOWA L. REV. 2125, 2127 (2021) ("The nation's transportation system, like other American systems, has been deployed to maximize the oppression of Black America while accelerating the accumulation of political and economic power in white communities.").

66. *See* Nathaniel Baum-Snow, *Did Highways Cause Suburbanization?*, 122 Q.J. ECON. 775, 775 (2007) (arguing that the "construction of new limited access highways" contributed to increased suburbanization between 1950 and 1990); Deborah N. Archer, *"White Men's Roads Through Black Men's Homes": Advancing Racial Equity Through Highway Reconstruction*, 73 VAND. L. REV. 1259, 1273–85

the construction of single-family homes facilitated a burst of white expansion into the suburbs.[67] The federal government commonly denied black families and individuals loans to buy homes in the suburbs and racially restrictive covenants further entrenched racial segregation.[68] Simultaneously, the federal government cut funding for the improvement and construction of homes and housing units in urban areas where new nonwhite immigrants resided and nonwhite majority populations remained.[69] In turn, industry, wealth, and job opportunity moved from declining urban neighborhoods to the suburbs as well.[70]

Sociologists and demographers are calling attention to a new type of migration that is taking hold across the United States in which nonwhite families and individuals are increasingly leaving urban neighborhoods with historically nonwhite majority populations for the suburbs and other localities with white majority populations.[71] Rather than migrating to cities, new immigrants (and non-European immigrants of color in particular) are also increasingly migrating directly to the suburbs and other areas with white majority populations.[72] Data shows that in reaction, white families and individuals are leaving those areas at increasing rates and choosing to self-segregate in different isolated communities in what cultural critic and anthropologist Rich Benjamin describes as "Whitopias."[73] In lowering the time

(2020) (describing how the development of the interstate highway system destroyed or isolated black communities).

67. Robert J. Antonio & Alessandro Bonanno, *A New Global Capitalism?: From "Americanism and Fordism" to "Americanization-Globalization*," 41 AM. STUD. 33, 36 (2000) ("Explosive growth of federally subsidized suburbs (single-family homes and highway systems) and of the standard middle-class consumer package (e.g., autos and home appliances) forged a new mass consumer society."); Clayton Nall, *The Political Consequences of Spatial Policies: How Interstate Highways Facilitated Geographic Polarization*, 77 J. POL. 394, 395 (2015) ("Highways . . . enabl[ed] whites and middle- and upper-class citizens to move from declining cities into single family residential neighborhoods along suburban freeways.").

68. Archer, *supra* note 66, at 1288–89 ("The federal government denied home loans to Black people looking to live in white suburban communities, and racially restrictive covenants prevented some homeowners from selling their homes to Black people.").

69. William H. Frey, *Black In-Migration, White Flight, and the Changing Economic Base of the Central City*, 85 AM. J. SOCIO. 1396, 1397 (1980) (describing nonwhite immigration and residential trends in urban areas after World War II); MICHAEL B. KATZ, THE UNDESERVING POOR: FROM THE WAR ON POVERTY TO THE WAR ON WELFARE 134–35 (1989) (describing funding cuts).

70. Baum-Snow, *supra* note 66, at 801 (describing how new interstate highways allowed firms to move to the suburbs between 1950 and 1990).

71. Karyn Lacy, *The New Sociology of the Suburbs: A Research Agenda for Analysis of Emerging Trends*, 42 ANN. REV. SOCIO. 369, 370 (2016) ("In the last three decades, the population of poor people, immigrants, and blacks living in the suburbs have all increased dramatically.").

72. *Id.* at 374 (describing recent suburban residential trends involving U.S. immigrants).

73. RICH BENJAMIN, SEARCHING FOR WHITOPIA: AN IMPROBABLE JOURNEY TO THE HEART OF WHITE AMERICA 5 (2009); Angela Onwuachi-Willig, *Policing the Boundaries of Whiteness: The Tragedy of Being "Out of Place" from Emmett Till to Trayvon Martin*, 102 IOWA L. REV. 1113, 1154–57 (2017) (describing recent research on white residential self-segregation).

costs of commuting, some experts warn that autonomous vehicles could add fuel to the fire and drive society's expansion into the "exburbs."[74]

Physical changes to highways and roads with the growth of autonomous vehicles could enable these new migration patterns.[75] Researchers and commentators have discussed how investing in "smart" streets and highways that communicate with autonomous vehicles would optimize traffic flow and safety.[76] Some engineers are proposing models in which governments build sensors into existing driving infrastructure that allow autonomous vehicles to drive on the same highways and roads as conventional vehicles, likely in separate lanes.[77] For instance, in August 2020, policymakers in Michigan announced plans to redesign a forty-mile stretch of highway and roads between Detroit and Ann Arbor that would reserve a dedicated lane for self-driving vehicles.[78] Other engineers, however, are proposing models that would create exclusive highways and roads for autonomous vehicles.[79] Consistent with this idea, a major venture capitalist group recently proposed limiting driving on

74. McLaughlin, *supra* note 53; Yonah Freemark, Anne Hudson & Jinhua Zhao, *Are Cities Prepared for Autonomous Vehicles? Planning for Technological Change by U.S. Local Governments*, 85 J. AM. PLAN. ASS'N 133, 134 (2019) ("The willingness of some [autonomous vehicle] commuters to travel further, for example, could encourage sprawl and, in the process, increase . . . income-based segregation.").

75. *Cf.* Abdellah Chehri & Hussein T. Mouftah, *Autonomous Vehicles in the Sustainable Cities, the Beginning of a Green Adventure*, 51 SUSTAINABLE CITIES & SOC'Y 101751, Aug. 2019, at 1, 3 ("A modernization of highways and roads will undoubtedly accompany vehicular automation.").

76. *See, e.g.*, Chuck Harrington, *Why the Future of Driving Needs Smart Infrastructure*, PARSONS (Jan. 26, 2020), https://www.parsons.com/2020/01/why-the-future-of-driving-needs-smart-infrastructure/ [https://perma.cc/7S48-XZ2W].

77. *See, e.g.*, Mahyar Amirgholy, Mehrdad Shahabi & H. Oliver Gao, *Traffic Automation and Lane Management for Communicant, Autonomous, and Human-Driven Vehicles*, 111 TRANSP. RSCH. PART C 477, 478 (2020) (proposing a three-lane system with different levels of automation technology to optimize traffic flow for when conventional and autonomous vehicles share the road); Mahyar Amirgholy, Mehdi Nourinejad & H. Oliver Gao, *Optimal Traffic Control at Smart Intersections: Automated Network Fundamental Diagram*, 137 TRANSP. RSCH. PART B 2, 3 (2020) ("[W]e propose a cooperative traffic control strategy for smart intersections to reduce congestion in urban networks."); Eduardo Felipe Zamborn Santana, Gustavo Covas, Fábio Duarte, Paolo Santi, Carlo Ratti & Fabio Kon, *Transitioning to a Driverless City: Evaluating a Hybrid System for Autonomous and Non-Autonomous Vehicles*, 107 SIMULATION MODELING PRAC. & THEORY 102210, 2021, at 1, 1 (simulating "a system of autonomous vehicles co-existing with human-driven vehicles" that "consists of a network of arterial roads with exclusive lanes for autonomous vehicles where they can travel in platoons").

78. *See* Roberto Baldwin, *Michigan Envisions Autonomous-Car Lane from Detroit to Ann Arbor*, CAR & DRIVER (Aug. 14, 2020), https://www.caranddriver.com/news/a33607287/michigan-autonomous-car-highway-planned/ [https://perma.cc/S7TD-PFZ5]; Jordyn Grzelewski & Daniel Howes, *Detroit-to-Ann Arbor Self-Driving Vehicle Corridor Aims for National Leadership*, DETROIT NEWS (Aug. 13, 2020, 6:52 PM), https://www.detroitnews.com/story/business/autos/mobility/2020/08/13/detroit-ann-arbor-self-driving-vehicle-corridor-moving-ahead/3364205001/ [https://perma.cc/YSC8-ZXAM].

79. *See, e.g.*, Gongyuan Lu, Yu (Marco) Nie, Xiaobo Liu & Denghui Li, *Trajectory-Based Traffic Management Inside an Autonomous Vehicle Zone*, 120 TRANSP. RSCH. PART B 76, 77 (2019).

Interstate 5 between Seattle and Vancouver to self-driving cars by 2040.[80] The needs and preferences of autonomous vehicle consumers, who are initially most likely to be in wealthier and more educated communities, could guide the locations to and from which exclusive smart lanes or highways and roads travel.

* * *

In sum, evidence from transportation data, market research, and history indicate that structural inequalities along the lines of race and class will create barriers that inhibit the most overpoliced and marginalized populations in our current driving regime from owning and accessing autonomous vehicles. This Article now turns to explore how those trends could exacerbate race- and class-based injustices involving traffic enforcement and policing against the conventional vehicles that remain on the road in the advent of autonomous vehicles.

II. FUNDAMENTAL SHIFTS IN POLICE REGULATION OF TRAFFIC

This part explores how the growth of autonomous vehicles could engender fundamental shifts in the police regulation of traffic that worsen race- and class-based injustices in the traffic space. To lay the groundwork for these points, Section II.A explores how autonomous vehicles are expected to avoid many types of traffic violations, including those that are most heavily policed today. Building on that analysis, Section II.B examines how traffic enforcement and policing during traffic stops will more sharply focus on conventional vehicles that remain on the road in a mixed-traffic regime. Section II.C then explores how the spatial and geographic boundaries of where police enforce traffic laws could also shift. As discussed, these changes would further erode racial and economic fairness and equality in traffic enforcement and policing against conventional vehicles in a mixed-traffic regime.

A. *Autonomous Vehicles and Conventional Traffic Laws*

Autonomous vehicles are expected to avoid many types of traffic law violations, including those that are most heavily policed and enforced today.[81] The analysis below first evaluates the capability of autonomous vehicles to avoid moving violations (for instance, speeding, failing to stop at a stop sign, and

80. MADRONA VENTURE GRP., CONVERT I-5 INTO AN AUTONOMOUS VEHICLE CORRIDOR 3 (2017), https://www.madrona.com/wp-content/uploads/2017/09/MVG-I5-Proposal-Digital.pdf [https://perma.cc/C5NP-Z4QP] ("We propose that by 2040, at the latest, all of I-5 be completely autonomous, and no human-driven cars be allowed on the highway.").

81. *See infra* Section II.A.1.

failure to signal before turning).[82] It then turns to discuss nonmoving violations (for instance, driver's license and registration violations).[83]

1. Moving Violations

Autonomous vehicles will have the capability to avoid many types of moving violations. Autonomous vehicles are expected to be programmed to follow traffic rules (for example, speed limits) and real-time mapping will enable the vehicles to obey traffic signals (for example, stop lights and stop signs).[84] Sensory technology and network connectivity systems will prevent autonomous vehicles from tailgating or coming into contact with other vehicles.[85] In addition, people who are intoxicated will be able to travel in autonomous vehicles without posing a public safety risk from driving under the influence.[86]

The ability of autonomous vehicles to avoid moving violations is important given the centrality of moving violations in traffic enforcement today. To illustrate these points, consider multiyear statewide traffic stop data from the state of Connecticut. As part of its Racial Profiling Prohibition Project, Connecticut collects, maintains, and provides public access to annual

82. *See infra* Section II.A.1.

83. *See infra* Section II.A.2.

84. Robert B. Kelley & Mark D. Johnson, *Defining a Stable, Protected and Secure Spectrum Environment for Autonomous Vehicles*, 52 SANTA CLARA L. REV. 1271, 1279 (2012) ("Autonomous vehicles rely on GPS to provide real-time, dynamic location and mapping information."); Harry Surden & Mary-Anne Williams, *Technological Opacity, Predictability, and Self-Driving Cars*, 38 CARDOZO L. REV. 121, 138–40 (2016) (discussing digital mapping in autonomous vehicles).

85. Surden & Williams, *supra* note 84, at 137–38 (2016) (discussing sensory technology in autonomous vehicles); Woods, *supra* note 16, at 86 ("A key feature of autonomous vehicles is that built-in sensors will largely prevent collisions with other vehicles or people.").

86. Leon Booth, Richard Norman & Simone Pettigrew, *The Potential Effects of Autonomous Vehicles on Alcohol Consumption and Drink-Driving Behaviours*, 39 DRUG & ALCOHOL REV. 604, 605–06 (2020) (reporting results from an Australian study that "[c]onsistent with previous research . . . autonomous vehicles could reduce drink-driving rates as almost half of the respondents indicated they would be likely to use autonomous vehicles after drinking"); Frank Douma & Sarah Aue Palodichuk, *Criminal Liability Issues Created by Autonomous Vehicles*, 52 SANTA CLARA L. REV. 1157, 1163 (2012) ("The possibility of removing drunk drivers from the road is one of the most prominent benefits autonomous vehicles might provide."); Jeffrey K. Gurney, *Driving into the Unknown: Examining the Crossroads of Criminal Law and Autonomous Vehicles*, 5 WAKE FOREST J.L. & POL'Y 393, 422 (2015) (arguing that if an autonomous vehicle is capable of taking an intoxicated occupant home, "no punishment purposes are served by ticketing the operator for driving under the influence of alcohol"); Katherine L. Hanna, *Old Laws, New Tricks: Drunk Driving and Autonomous Vehicles*, 55 JURIMETRICS 275, 282 (2015) ("A level-4 car would basically function as a personal chauffeured vehicle taking the occupants to the bar and back to the house, parking itself appropriately, and perhaps even shuttling other people around while the occupants are in the bar."); Steven Van Uytsel & Danilo Vasconcellos Vargas, *Challenges for and with Autonomous Vehicles: An Introduction*, *in* AUTONOMOUS VEHICLES 1, 2 (Steven Van Uytsel & Danilo Vasconcellos Vargas eds., 2020) ("What is for sure, autonomous vehicles will have the potential to eliminate drunk driving or driving with fatigue.").

traffic stop data from all law enforcement departments across the state.[87] Unlike most publicly available statewide traffic stop data, the Connecticut data tracks the underlying traffic violations that led to each stop.[88]

Table 1 below aggregates and presents data on the underlying traffic violations for the 2,117,951 traffic stops that officers conducted in Connecticut between 2016 and 2019 (the four most recent complete years of data).[89] The data reveal that moving (non-seatbelt) violations accounted for approximately two in every three (66.37%) traffic stops in Connecticut. Common examples included speeding, not obeying a traffic control signal, and stop sign violations.[90]

87. *Connecticut Traffic Stop Data*, CT DATA COLLABORATIVE, http://trafficstops.ctdata.org/ [https://perma.cc/T74A-BG34].

88. *Id.* (datasets are available by clicking on "Download Data" and then "[d]ownload full datasets for all police departments in Connecticut" at the bottom of the page). The underlying traffic violation is listed under the "ReasonForStop" field in each annual database. Fifteen reasons for the stops were recorded in the databases: window tint, unlicensed operation, traffic control signal, stop sign, STC (state traffic commission violations), speed related, seatbelt, registration, other, moving violation, equipment violation, display of plates, defective lights, cell phone, and administrative offense. For simplicity purposes, I then reclassified these fifteen bases into the following violation categories: moving (non-seatbelt), paperwork (non-license)/plates, equipment, administrative offense, license, seatbelt, other, and visibility.

89. *Id.* Datasets are available for October 2015–September 2016, October 2016–December 2017, January 2018–December 2018, and January 2019–December 2019. 2020 data are not yet available. Stops conducted between October 2015 and December 2015 were omitted from the analysis above. Connecticut officers conducted 512,697 traffic stops in 2019, 508,361 traffic stops in 2018, 663,855 stops between October 2016 and December 2017, and 433,038 stops between January 2016 and September 2016. *Id.*

90. *See infra* note 91 (listing moving violations). In addition to the presented data from Connecticut, older surveys also illustrate the centrality of moving violations in traffic enforcement. *See, e.g.*, Joh, *Discretionless Policing*, *supra* note 25, at 222 tbl.1 & n.146 (presenting data from a 2002 survey conducted by the Bureau of Justice Statistics showing that 54% of traffic stops evaluated in the study involved speeding alone).

Table 1. Traffic Stops in Connecticut by Underlying Traffic Violation, 2016–2019

Traffic Violation Type	Frequency	Percent
Moving (Non-Seatbelt)[91]	1,405,760	66.37
Paperwork (Non-License)/Plates[92]	263,132	12.42
Equipment[93]	196,406	9.27
Other	105,675	4.99
Seatbelt	69,554	3.28
Administrative Offense[94]	38,971	1.84
Visibility[95]	25,729	1.22
License	12,724	0.60
Total	2,117,951	100.00

Traffic citation data (as opposed to traffic stop data) provide another angle to see the centrality of moving violations in current traffic enforcement. Here, traffic citation data from New York State are instructive. As part of its open data initiative, New York State recently released a comprehensive database of tickets on file with the New York State Department of Motor Vehicles.[96] Importantly, the database tracks the underlying traffic violation for each issued traffic ticket.[97]

Table 2 below aggregates and presents the relevant data on the underlying traffic violations for the 14,163,404 traffic tickets issued in New York State between 2013 and 2017 (the four most recent complete years of data). The data

91. *Connecticut Traffic Stop Data*, *supra* note 87. This included speeding (596,145 stops), cell phone violations (183,202 stops), general moving violations (165,306 stops), ignoring a traffic control signal (148,875 stops), stop sign violations (153,067 stops), and state traffic commission violations (159,165 stops). *Id.*

92. *Id.* This included registration violations (202,867 stops) and display of plates violations (60,265 stops). *Id.*

93. *Id.* This included defective lights (191,842 stops) and general equipment violations (4,564 stops). *Id.*

94. *Id.* The administrative offenses were a mix of license and registration violations.

95. *Id.* This included window tint violations.

96. *Traffic Stops Issued: Four Year Window*, N.Y. ST., https://data.ny.gov/Transportation/ Traffic-Tickets-Issued-Four-Year-Window/q4hy-kbtf [https://perma.cc/53WY-E6MU].

97. To see a visualization of the frequencies of each traffic violation type, see *id.*, click "Create Visualization" under "Table Preview" and select "Violation Description" in the "Dimension" search field. That visualization displays the number of traffic tickets issued for the top 200 traffic violations in the state. I then reclassified those 200 traffic violations into the following violation categories: moving (non-seatbelt), paperwork (non-license)/plate, equipment, license, seatbelt, other, unclear, visibility, and bicycle/pedestrian.

reveal that moving (non-seatbelt) violations accounted for over half (53.46%) of the traffic tickets issued in the state.

Table 2. Traffic Citations Issued in New York State by Reason for Citation, 2013–2017

Traffic Violation Type	Frequency	Percent
Moving (Non-Seatbelt)[98]	7,571,547	53.46
Paperwork (Non-License)/Plate[99]	2,010,313	14.19
Equipment[100]	1,883,322	13.30
License[101]	1,289,387	9.10
Seatbelt[102]	703,735	4.97
Other[103]	332,528	2.35
Unclear[104]	70,255	0.50
Visibility[105]	182,963	1.29
Bicycle/Pedestrian	119,354	0.84
Total	14,163,404	100.00

2. Nonmoving Violations

Whether autonomous vehicles will be capable of avoiding or circumventing laws involving nonmoving violations (for instance, driver's license violations, equipment violations, and visibility violations) is also possible, but more uncertain.[106]

Some experts and commentators predict that autonomous vehicles could spawn major changes to driver's license laws.[107] The basic idea is that if human

98. *See infra* Appendix.

99. *See infra* Appendix.

100. *See infra* Appendix.

101. *See infra* Appendix.

102. *See infra* Appendix.

103. *See infra* Appendix.

104. *See infra* Appendix. Unclear violations included citations for document violations, but it was unclear whether the document involved a driver's license or another document.

105. *See infra* Appendix.

106. Woods, *supra* note 16, at 86.

107. *See, e.g.*, Ronald C. Fisher, *Government Expenditure Implications of Autonomous Vehicles*, 73 NAT'L TAX J. 235, 247 (2020) ("Use of autonomous vehicles may require a different form of license or none at all."); Doug Newcomb, *You Won't Need a Driver's License by 2040*, WIRED (Sept. 17, 2012, 1:42 PM), https://www.wired.com/2012/09/ieee-autonomous-2040 [https://perma.cc/KH32-8TFZ] (speculating that autonomous vehicles may lead to the disappearance of driver licensing); David C. Schwebel, *Child/Adolescent Development and Autonomous Vehicle Operation: "Operator's Licenses" Instead of*

drivers are not required to take control of autonomous vehicles, then there is no public safety need to require a driver's license.[108] Several states have already enacted legislation that exempts operators of fully autonomous vehicles from driver's license requirements or allows fully autonomous vehicles to drive on the road without a human operator.[109]

Scholars and researchers further describe how significant reductions in traffic accidents and the removal of human error from driving could eliminate the need for autonomous vehicle drivers to purchase auto insurance.[110] Some experts expect that the purchase price of autonomous vehicles will subsume standard insurance costs as liability for accidents shifts away from autonomous vehicle owners to auto manufacturers.[111] If autonomous vehicle owners do not need to purchase auto insurance, then traffic laws requiring drivers to be able to provide proof of insurance may no longer apply to autonomous vehicle occupants.

Driver's Licenses, 10 J. INJ. & VIOLENCE RSCH. 61, 61 (2018) ("What we today call 'driver's licenses' may soon become outdated artifacts . . . .").

108. Woods, *supra* note 16, at 88–89.

109. *See, e.g.*, FLA. STAT. ANN. § 316.85(1) (Westlaw through laws and joint resolutions in effect from the 2021 1st Reg. Sess. and Spec. "A" Sess. of the 27th Leg.) ("Notwithstanding any other law, a licensed human operator is not required to operate a fully autonomous vehicle . . . ."); GA. CODE ANN. § 40-5-21(a)(13) (LEXIS through 2021 Reg. Sess. of the Gen. Assemb.) (exempting from license requirement "a fully autonomous vehicle with the automated driving system engaged or the operator of a fully autonomous vehicle with the automated driving system engaged"); NEB. REV. STAT. ANN. § 60-3302 (LEXIS through all Acts of the 1st Reg. Sess. of the 107th Leg. (2021), and all Acts of the 1st Spec. Sess. of the 107th Leg. (2021)) ("A driverless-capable vehicle may operate on the public roads of this state without a conventional human driver physically present in the vehicle . . . ."); N.C. GEN. STAT. § 20-401(a) (LEXIS through Sess. Laws 2021-162 of the 2021 Reg. Sess. of the Gen. Assemb.) ("[T]he operator of a fully autonomous vehicle with the automated driving system engaged is not required to be licensed to operate a motor vehicle."); N.D. CENT. CODE § 39-01-01.2.3 (LEXIS through end of the 2021 67th Legis. Assemb.) ("An autonomous vehicle with automated driving systems engaged does not require a human driver to operate on the public highway if the autonomous vehicle is capable of achieving a minimal risk condition."); NEV. REV. STAT. ANN. § 482A.200 (LEXIS through Chapters 1–32, 34–41, 43–52, 54–59, 62–76, 78–154, 156–159, 161–170, 173–178, 180–187, 189–228, 230–237, 239–243, 245–276, 278, 279, 283–285, 287, 288, 290–330, 332–346, 348–362, 364–368, 371, 377–382, 384, 373, 374, 389–397, 399–407, 411, 413, 414, 416–418, 420–422, 424–443, 444–474, 476, 477, 480–489, 491, 493–496, 498–501, 503, 507–510, 512, 514–516, 518, 523, 524, 526–529, 531–544, 546, 550, 551, and 557 of the 81st Reg. Sess. (2021)) ("No motor vehicle laws or traffic laws of this State shall be construed to require a human driver to operate a fully autonomous vehicle which is being operated by an automated driving system.").

110. Geistfeld, *A Roadmap for Autonomous Vehicles*, *supra* note 15, at 1616 ("As autonomous vehicles become more common on the roadways, the substantial reduction in the number of crashes will substantially decrease both the cost of and need for personal auto insurance."); Lynne McChristian & Richard Corbett, *Regulatory Issues Related to Autonomous Vehicles*, 35 J. INS. REGUL. 1, 10 (2016) (hypothesizing that "the shift in liability from the driver to the automaker or manufacturer of the AV [autonomous vehicle] technology raises the probability that insurance becomes a standard feature, part of the purchase price of a self-driving vehicle").

111. McChristian & Corbett, *supra* note 110, at 10. For a general overview of different liability regimes for autonomous vehicles, see Steven Van Uytsel, *Different Liability Regimes for Autonomous Vehicles: One Preferable Above the Other?*, *in* AUTONOMOUS VEHICLES, *supra* note 86, at 67–92.

Visibility violations designed to ensure that human drivers can adequately control conventional vehicles (for instance, window tints or obstructed windshield views) may also be deemed unnecessary for autonomous vehicles.[112] This is especially the case if autonomous vehicles are equipped with sensors, network connectivity systems, and infrared and laser lighting systems that fully function in severe weather conditions.[113]

* * *

The promise of autonomous vehicles to avoid traffic violations and traffic accidents has been largely discussed through the lens of traffic safety.[114] On one hand, these traffic safety benefits are directly relevant to police work given that accident investigations are a major component of police work today.[115] Motor vehicle accidents are also the leading cause of accidental death for on-duty law enforcement officers in the United States.[116] On the other hand, the issue of whether the traffic safety benefits of autonomous vehicles will come at the cost

112. Jeff Daniel Clark, *Driverless Cars and Criminal Justice Resource Allocation*, 22 SMU SCI. & TECH. L. REV. 195, 208 (2019) ("Laws regulating window tinting are aimed at ensuring driver visibility, but those laws would be unnecessary for driverless cars.").

113. *See* John R. Quain, *These High-Tech Sensors May Be the Key to Autonomous Cars*, N.Y. TIMES (Sept. 26, 2019), https://www.nytimes.com/2019/09/26/business/autonomous-cars-sensors.html [https://perma.cc/PY4Y-FVF3 (dark archive)] (discussing infrared and laser lighting systems); Anthony Cuthbertson, *Reinventing the Seatbelt for the Self-Driving Era*, INDEPENDENT (Aug. 19, 2019, 12:34 PM), https://www.independent.co.uk/life-style/gadgets-and-tech/features/self-driving-cars-safety-volvo-360c-seat-belt-autonomous-a8991301.html [https://perma.cc/U7UD-MWQZ] (discussing possibilities for autonomous vehicles to use color and sound to communicate with conventional vehicles).

114. *See, e.g.*, Geistfeld, *A Roadmap for Autonomous Vehicles*, *supra* note 15, at 1615 (discussing the expected traffic safety benefits of autonomous vehicles); *see also* DANIEL SPERLING, THREE REVOLUTIONS: STEERING AUTOMATED, SHARED, AND ELECTRIC VEHICLES TO A BETTER FUTURE 82 (2018) ("The most certain clear-cut benefit of both self-driving and driverless vehicles is safety. Fully automated cars will be much safer than those with human drivers."); Pearl, *supra* note 11, at 1842 ("Enhanced motor vehicle safety . . . is overwhelmingly the largest benefit that autonomous vehicles stand to offer."). Relevant to this point, the National Highway and Traffic Safety Administration estimates that 94% of serious traffic accidents are attributable to human error, such as distraction, sleep deprivation, and intoxication. Surden & Williams, *supra* note 84, at 128.

115. *See* GARY W. CORDNER, POLICE ADMINISTRATION 72 (9th ed. 2016) ("The traffic task includes several subtasks relating to different police activities vis-à-vis motor vehicles. These subtasks include intersection control (traffic direction), traffic law enforcement, parking law enforcement, and traffic accident investigation."); Jay L. Zagorsky, *Cops May Feel the Biggest Impact from Driverless Car Revolution*, CONVERSATION (Mar. 16, 2015, 5:39 AM), https://theconversation.com/cops-may-feel-biggest-impact-from-driverless-car-revolution-38767 [https://perma.cc/6746-9569] (noting that "much of [police officers'] actual day-to-day work involves enforcing traffic rules and responding to accidents").

116. For instance, according to the most recent available data from the Federal Bureau of Investigation, of the forty-one officers accidentally killed in the line of duty in 2019, nineteen officers were killed in motor vehicle crashes and sixteen were pedestrian officers struck by vehicles. *See Table 65, Law Enforcement Officers Killed and Assaulted*: *Type of Accident and Activity of Victim Officer*, *2015–2019*, FBI, https://ucr.fbi.gov/leoka/2019/tables/table-65.xls [https://perma.cc/A8TZ-KFNT]; *see also* Tom LaTourrette, *Risk Factors for Injury in Law Enforcement Officer Vehicle Crashes*, 38 POLICING 478, 478 (2015) (studying risks that on-duty police officers face from traffic accidents).

of exacerbating policing harms to civilians in the traffic space has been less of a focus in scholarly and policy conversations. The next sections now turn to examine those issues.

B. *Conventional Vehicles and Increased Risk of Police Contact Through Traffic Enforcement*

If police retain their current role in traffic enforcement in the advent of autonomous vehicles, then officers will continue to conduct traffic stops on vehicles that violate the rules of the road. With the ability to avoid many types of traffic violations, autonomous vehicles will be naturally shielded from the bulk of traffic law enforcement.[117] As a result, traffic enforcement will gradually and more acutely target conventional vehicles that cannot automatically avoid traffic violations, and moving violations in particular. As autonomous vehicles become more ubiquitous, the number of potential vehicles to stop and issue citations for traffic violations will decline.[118]

These shifts are a cause for concern given that state and local governments rely heavily on traffic ticket revenue and fines and fees from traffic cases to fund their respective budgets.[119] Pressure to make up for losses in traffic ticket revenue could provide a major incentive for more targeted and aggressive traffic enforcement against conventional vehicles that cannot avoid traffic violations, especially moving violations.[120] Lending support to this idea, studies show that

117. Of course, this does not mean that autonomous vehicles or their occupants will not be policed at all. *See* sources cited *supra* notes 37–38.

118. Clark, *supra* note 112, at 202 (noting that "traffic stops and citations for traffic law infractions will be vanishingly rare" in the advent of autonomous vehicles); Kevin Davis, *Preparing for a Future with Autonomous Vehicles*, POLICE CHIEF MAG. (2016), https://www.policechiefmagazine.org/preparing-for-a-future-with-autonomous-vehicles/ [https://perma.cc/BGP9-MCAV] (noting the "significant reduction in traffic stops and related citations" in the advent of autonomous vehicles).

119. Beth A. Colgan, *Beyond Graduation: Economic Sanctions and Structural Reform*, 69 DUKE L.J. 1529, 1552–53 (2020) ("[R]esearchers have linked increased traffic ticketing to both budgetary shortfalls and statutory limitations on other mechanisms for generating revenue such as property tax caps."); Thomas A. Garrett & Gary A. Wagner, *Red Ink in the Rearview Mirror: Local Fiscal Conditions and the Issuance of Traffic Tickets*, 52 J.L. & ECON. 71, 71 (2009) (concluding based on results from an empirical study that "tickets are used as a revenue-generation tool rather than solely a means to increase public safety").

120. *See* Gregory M. Stein, *The Impact of Autonomous Vehicles on Urban Land Use Patterns*, 48 FLA. ST. U. L. REV. 193, 203 (2021) (noting that "fines for traffic violations . . . will dry up" in the advent of autonomous vehicles); Selika Josiah Talbot, *The Political Economy of Autonomous Vehicles*, FORBES (June 23, 2020, 7:51 PM), https://www.forbes.com/sites/selikajosiahtalbott/2020/06/23/the-political-economy-of-autonomous-vehicles/#162fdcee1555 [https://perma.cc/9CUH-UDEE (dark archive)] ("Given that autonomous vehicles are programmed to obey traffic laws and comply with regulations of operating on the roadways, what will offset the loss of millions of dollars of vehicle infraction violation fees that many cities use to plug the holes in their budgets?").

traffic ticketing practices increase at times when municipal tax revenues are lower or in times of municipal fiscal distress.[121]

Lower-income people, and especially lower-income people of color, are already targeted and harmed the most by aggressive traffic enforcement practices. Traffic debt traps many low-income people, and especially low-income people of color, in a vicious cycle of poverty and criminal justice involvement.[122] For many people living in poverty, the cost of a single traffic ticket is beyond their living means.[123] Unpaid traffic debt and failure to appear in court for a traffic ticket can result in hundreds of dollars of additional financial penalties, loss of a driver's license, garnished wages, and even incarceration.[124]

The growth of autonomous vehicles, however, could exacerbate race- and class-based injustices that stem from police regulation of traffic in other nuanced ways. For instance, vehicle condition is a common proxy that officers use to identify "suspicious activity."[125] When used as a proxy in this fashion,

121. *See, e.g.*, Garrett & Wagner, *supra* note 119, at 86 (finding that "negative changes in local revenue from the previous fiscal year are significantly correlated with the change in the number of tickets issued"); Michael D. Makowsky & Thomas Stratmann, *More Tickets, Fewer Accidents: How Cash-Strapped Towns Make for Safer Roads*, 54 J.L. & ECON. 863, 865 (2011) ("When towns are in fiscal distress, government officials have an incentive to seek extra revenues not only through an increase in property taxes but also by increasing fines. One potential source of fines is traffic tickets.").

122. Emily Reina Dindial & Ronald J. Lampard, Opinion, *When a Traffic Ticket Costs $13,000*, N.Y. TIMES (May 27, 2019), https://www.nytimes.com/2019/05/27/opinion/drivers-license-suspension-fees.html [https://perma.cc/Y85R-T387 (dark archive)] ("The criminal justice system too often produces a self-perpetuating cycle, particularly for the poorest people, who can't pay fines or hire lawyers to make charges go away."); Veryl Pow, Comment, *Rebellious Social Movement Lawyering Against Traffic Court Debt*, 64 UCLA L. REV. 1770, 1774 (2017) ("[T]he failure to pay off traffic court debt can result in arrest and incarceration . . . .").

123. *See* ALEX BENDER, STEPHAN BINGHAM, MARI CASTALDI, ELISA DELLA PIANA, MEREDITH DESAUTELS, MICHAEL HERALD, ENDRIA RICHARDSON, JESSE STOUT & THERESA ZHEN, NOT JUST A FERGUSON PROBLEM: HOW TRAFFIC COURTS DRIVE INEQUALITY IN CALIFORNIA 6 (2015), https://lccr.com/wp-content/uploads/Not-Just-a-Ferguson-Problem-How-Traffic-Courts-Drive-Inequality-in-California-4.20.15.pdf [https://perma.cc/6FCL-4SEW] ("As the fees have gone up . . . fewer people can afford to pay their tickets.").

124. William E. Crozier & Brandon L. Garrett, *Driven to Failure: An Empirical Analysis of Driver's License Suspension in North Carolina*, 69 DUKE L.J. 1585, 1587 (2020) ("A suspended license can result in negative consequences ranging from job loss, to restricted career opportunities, to limited mobility, to name a few."); Oona Hathaway & Scott J. Shapiro, *Outcasting: Enforcement in Domestic and International Law*, 121 YALE L.J. 252, 271 (2011) ("[U]npaid parking tickets may be enforced through the garnishment of wages."); BENDER ET AL., *supra* note 123, at 6 (discussing the various hardships people living in poverty can suffer when their driver's licenses are suspended for inability to pay a traffic ticket or failure to appear in traffic court).

125. *See, e.g.*, Ornelas v. United States, 517 U.S. 690, 692 (1996) (involving an officer who asserted that "older model, two-door General Motors cars are a favorite with drug couriers because it is easy to hide things in them"); United States v. Madrigal, 626 F. App'x 448, 451 (5th Cir. 2015) (involving an officer who "relied on the fact that [the defendant] drove an older and recently registered truck in creating suspicion because many drug couriers use such vehicles"); United States v. De La Cruz-Tapia 162 F.3d 1275, 1278 (10th Cir. 1998) (involving an officer who testified that "[o]lder model vehicles like this one are consistent with the trend toward illegal aliens and drug trafficking"); United States v.

vehicle condition can give effect to officers' subjective and biased judgments about the social positions and assumed criminality of vehicle occupants.[126] Scholars describe that officer judgments about "suspicious activity" are often intertwined with improper race- and class-based assumptions.[127] In a mixed-traffic regime, officers could use conventional vehicles, and especially older conventional vehicles, as proxies that give even stronger effect to these improper assumptions.

With the growth of autonomous vehicles, racial disparities for moving violations could also emerge in localities or become more pronounced in areas where those disparities already exist. Some studies have found lower degrees of racial disparity for traffic stops initiated on black and white drivers for moving violations compared to nonmoving violations in certain localities.[128] In explaining these differences, researchers have argued that moving violations are less prone to discretionary and pretextual stops.[129] For instance, officers might not be able to observe a driver's race or other personal characteristics when

Salinas, 940 F.2d 392, 393–94 (9th Cir. 1991) (involving an officer who "noticed that the vehicle was an older model with a large trunk and passenger area which, in his experience, was of a type commonly used for drug and alien smuggling"); United States v. Payano, No. 17-238, 2017 WL 11466349, at *1 (E.D. Pa. Sept. 26, 2017) (involving an officer who testified "that the Ford Focus was an older model and that 'drug trafficking organizations commonly use vehicles that are 10 to 15 years old'").

126. Megan Welsh, Joshua Chanin & Stuart Henry, *Complex Colorblindness in Police Processes and Practices*, 68 SOC. PROBS. 374, 386–87 (2021) (discussing connections between racial profiling and the use of older vehicles as a proxy for assumed drug criminality).

127. For a comprehensive discussion of the "suspicion heuristic," see L. Song Richardson & Phillip Atiba Goff, *Self-Defense and the Suspicion Heuristic*, 98 IOWA L. REV. 293, 296–314 (2012). *See also* Carbado, *supra* note 1, at 152–53 (discussing connections between "racial suspicion" and traffic stops for criminal investigatory purposes).

128. *See, e.g.*, Travis L. Dixon, Terry L. Schell, Howard Giles & Kristin L. Drogos, *The Influence of Race in Police-Civilian Interactions: A Content Analysis of Videotaped Interactions Taken During Cincinnati Police Stops*, 58 J. COMM. 530, 539 (2008) (presenting study findings showing that "a lower proportion of the stops of Black drivers occurred due to moving violations"); ALEXANDER WEISS & DENNIS P. ROSENBAUM, UNIV. OF ILL. AT CHI. CTR. FOR RSCH. IN L. & JUST., ILLINOIS TRAFFIC STOPS STATISTICS STUDY: 2008 ANNUAL REPORT 7 (2009), http://www.idot.illinois.gov/assets/uploads/files/transportation-system/reports/safety/traffic-stop-studies/2008/2008%20illinois%20traffic%20stop%20summary.pdf [https://perma.cc/3FHP-GF6X] (finding that Caucasian drivers were more likely to be stopped for a moving violation than minority drivers (73.91% of Caucasian vs. 68.19% of minority)); POLICING PROJECT, N.Y. UNIV. SCH. OF L., AN ASSESSMENT OF TRAFFIC STOPS AND POLICING STRATEGIES IN NASHVILLE 7 (2018) [hereinafter POLICING PROJECT], https://www.nashville.gov/Portals/0/SiteContent/MayorsOffice/docs/reports/policing-project-nashville-report.pdf [https://perma.cc/WQ2W-AAZ3] (presenting study findings showing that "[r]acial disparities are notably higher for non-moving violation stops than for moving violations").

129. Kirk Miller, *Race, Driving, and Police Organization: Modeling Moving and Nonmoving Traffic Stops with Citizen Self-Reports of Driving Practices*, 37 J. CRIM. JUST. 564, 566 (2009) ("Moving violations, and especially speeding, are less prone to the dynamics that contribute to police use of traffic violations as a pretext to stop and question drivers . . . .").

vehicles are driving at high speeds or at night time until after a traffic stop is initiated.[130]

Even if officers cannot see a driver when vehicles are driving at nighttime or at high speeds, the capability of autonomous vehicles to avoid moving violations will systematically shield autonomous vehicle occupants from those types of stops.[131] As previously discussed, several indicators from transportation data and market research suggest that the most overpoliced and over-criminalized populations in today's driving regime—namely, lower-income people and especially lower-income people of color—will face greater barriers to autonomous vehicle ownership and access.[132] Assume, for the sake of argument, that officers have less discretion in initiating moving violation stops. That lack of discretion could now work to further harm marginalized and over-policed communities in a mixed-traffic regime by giving effect to structural race- and class-based inequalities that guide who can and cannot own or access autonomous vehicles.

In addition, the growth of autonomous vehicles could exacerbate pretextual traffic stops based on nonmoving violations. Studies show that people of color are more likely to be stopped for nonmoving violations (for instance, equipment or registration violations) compared to white drivers.[133] Racial disparities involving traffic stops for nonmoving violations are especially high in lower-income neighborhoods with higher crime rates and where the majority of the resident population consists of people of color.[134] Scholars have argued that these trends lend support to the idea that officers commonly use

130. *Id.* ("Moving stops, and especially speeding stops, are less likely to be pretextual because drivers are obscured by a somewhat analogous blur of speed and/or movement, which should likewise limit officer perception of driver features, including race."); Pierson et al., *supra* note 3, at 736 ("We found that black drivers were less likely to be stopped after sunset, when a 'veil of darkness' masks one's race, suggesting bias in stop decisions."). Researchers Jeffrey Gogger and Greg Ridgeway coined this phenomenon as the "veil of darkness" hypothesis. *See* Jeffrey Gogger & Greg Ridgeway, *Testing for Racial Profiling in Traffic Stops from Behind a Veil of Darkness*, 101 J. AM. STAT. ASS'N 878, 878 (2006) ("Our approach is based on a simple assumption: During the night, police have greater difficulty observing the race of a suspect before they actually make a stop.").

131. *See supra* Part II.

132. *See supra* Part II.

133. *See, e.g.*, Dixon et al., *supra* note 128, at 539 (finding that "[t]he likelihood of being stopped for a nonmoving violation (e.g., expired registration) was twice as high for Black drivers as for White drivers"); POLICING PROJECT, *supra* note 128, at 7 (finding that the "per capita stop rate was 44% higher for black drivers than for white drivers").

134. POLICING PROJECT, *supra* note 128, at 8 (finding based on a study of the Nashville Police Department that "Nashville officers do make more non-moving violation stops in high crime neighborhoods, regardless of their racial composition"); Alex Chohlas-Wood, Sharad Goel, Amy Shoemaker & Ravi Shroff, AN ANALYSIS OF THE METROPOLITAN NASHVILLE POLICE DEPARTMENT'S TRAFFIC STOP PRACTICES 4 (2018), https://policylab.stanford.edu/media/nashville-traffic-stops.pdf [https://perma.cc/UGK3-5TEX] ("[T]he racial disparities in non-moving violation stops are at least partly attributable to such stops being made in high-crime areas—which, in Nashville, tend to be predominantly black.").

nonmoving violations as pretexts to investigate nontraffic crime.[135] The highly discretionary nature of traffic stops based on nonmoving violations enables these pretextual practices.[136]

If autonomous vehicles are capable of avoiding or can circumvent traffic laws that pertain to certain nonmoving violations (for instance, driver's license and visibility violations), then autonomous vehicle occupants will be automatically shielded from stops based on those violations as well.[137] Given their highly discretionary nature, pretextual traffic stops based on nonmoving violations could become even more targeted against drivers and passengers in conventional vehicles.[138] Current statistical trends indicate that people of color in lower-income neighborhoods with higher crime rates would be especially vulnerable to these more acute pretextual traffic stop practices.[139]

C. *The Spatial and Geographic Boundaries of Traffic Enforcement and Policing*

The growth of autonomous vehicles could also engender changes in the spatial and geographic boundaries of where traffic violations are enforced and policed. Legal scholars and criminologists have argued that trends involving policing and crime cannot be separated from the neighborhoods and localities in which those phenomena occur.[140] Related to this point, discrimination along the lines of race and class manifest both spatially and geographically.[141]

135. Miller, *supra* note 129, at 567 (noting that "nonmoving traffic violations, such as vehicle equipment, licensing and registration, and insurance violation are more commonly used as pretext to conduct a traffic stop"); Kenneth J. Novak, *Disparity and Racial Profiling in Traffic Enforcement*, 7 POLICE Q. 65, 86 (2004) (presenting study findings showing that "officers may be using equipment violations (for all races) as a pretext for investigative stops").

136. Miller, *supra* note 129, at 567 ("[N]onmoving traffic violations are more prone to the discretionary processes of officer decision-making.").

137. *See supra* Part I.

138. *See* Miller, *supra* note 129, at 567.

139. *See* sources cited *supra* note 134.

140. *See, e.g.*, DAVID WEISBURD, ELIZABETH R. GROFF & SUE-MING YANG, THE CRIMINOLOGY OF PLACE: STREET SEGMENTS AND OUR UNDERSTANDING OF THE CRIME PROBLEM 3–28 (2012) (describing "criminology of place" as criminological approach); Monica C. Bell, *Anti-Segregation Policing*, 95 N.Y.U. L. REV. 650, 687–728 (2020) [hereinafter Bell, *Anti-Segregation Policing*] (discussing mechanism of pro-segregation policing); I. Bennett Capers, *Policing, Race, and Place*, 44 HARV. C.R.-C.L. L. REV. 43, 68 (2009) [hereinafter Capers, *Policing, Race, and Place*] (discussing connections between policing, race, and place); Tracey L. Meares, *Place and Crime*, 73 CHI.-KENT L. REV. 669, 669 (1998).

141. *See* Bell, *Anti-Segregation Policing*, *supra* note 140, at 659–87 (discussing the persistence of residential segregation in the United States); Capers, *Policing, Race, and Place*, *supra* note 140, at 44 ("Spatial separateness allows social relationships to be structured along racial lines, which in turn has the effect of perpetuating and reinforcing social and economic inequality.").

Traffic stops play an important role in reinforcing those boundaries.[142] For instance, law enforcement officers use traffic stops as a way to stop and search "suspicious persons" who are perceived as "not belonging" or "out of place" in particular neighborhoods or areas.[143] Those judgments, which can be held by officers as well as community residents, are often intertwined with racialized and class-based assumptions involving criminality.[144]

Consider the possibility that autonomous vehicles first become mainstream in affluent or middle-class neighborhoods, especially in light of the previously discussed trends involving autonomous vehicle access and demand.[145] Officers and residents could use conventional vehicles, especially older conventional vehicles, as a proxy to support racialized suspicions about who "belongs" or seems "out-of-place" in those neighborhoods.[146] The expansive nature of traffic codes makes it relatively easy for officers to use a traffic violation as a pretext to pull over a conventional vehicle and ask drivers where they came from and where they are going.[147]

142. *See* Tim Bates & David Fasenfest, *Enforcement Mechanisms Discouraging Black-American Presence in Suburban Detroit*, 29 INT'L J. URB. & REG'L RSCH. 960, 960 (2005) (discussing evidence of more aggressive traffic policing on black drivers in suburban neighborhoods).

143. *See* Capers, *Policing, Race, and Place*, *supra* note 140, at 70 (identifying traffic laws as "[a]nother set of laws [that] facilitates the disproportionate targeting of minorities and others deemed out of place"); Harris, *supra* note 1, at 559 ("In the event that we see a suspicious automobile or occupant and wish to search the person or the car, or both, we will usually follow the vehicle until the driver makes a technical violation of a traffic law."); Wayne R. LaFave, *The "Routine Traffic Stop" from Start to Finish: Too Much "Routine," Not Enough Fourth Amendment*, 102 MICH. L. REV. 1843, 1844–45 (2004) (noting that traffic stops allow police to stop "suspicious travelers"); Kenneth J. Novak & Mitchell B. Chamlin, *Racial Threat, Suspicion, and Police Behavior: The Impact of Race and Place in Traffic Enforcement*, 58 CRIME & DELINQ. 275, 275 (2012) (presenting study findings supporting the conclusion that "social control increases among groups whose racial characteristics are inconsistent with the neighborhood racial composition").

144. *See* Carbado, *supra* note 1, at 152–53 (discussing connections between "racial suspicion" and traffic stops for criminal investigatory purposes); Leo Carroll & M. Lilliana Gonzalez, *Out of Place: Racial Stereotypes and the Ecology of Frisks and Searches Following Traffic Stops*, 51 J. RSCH. CRIME & DELINQ. 559, 559–60 (2014) (presenting findings on a study involving traffic stops showing that "[b]iased policing is largely the product of implicit stereotypes that are activated in contexts which Black drivers appear out of place and in police actions that require quick decisions providing little time to monitor cognitions"); *see also* Richardson & Goff, *supra* note 127, at 296–314 (discussing the suspicion heuristic in policing). Here, it is important to acknowledge that recent studies have found that White drivers are not subjected to equal police scrutiny involving out-of-place policing compared to Black drivers. *See* Lance Hannon, Malik Neal & Alex R. Gustafson, *Out-of-Place and In-Place Policing: An Examination of Traffic Stops in Racially Segregated Philadelphia*, 67 CRIME & DELINQ. 868, 868 (2021) (presenting study results showing that "in place or out of place, being seen as White is always an advantage in Philadelphia").

145. *See supra* Part I.

146. *See, e.g.*, Bates & Fasenfest, *supra* note 142, at 969 (presenting study findings showing that "it is on streets where black motorists were rare that they attracted the most attention of the Eastpointe police").

147. *See* Harris, *supra* note 1, at 559 (noting the "true scope of traffic codes" and "the limitless opportunities they give police to make pretextual stops"); Joh, *Discretionless Policing*, *supra* note 25, at 210 ("[T]he vehicle code provides an officer with any reason to stop virtually anyone."). For a more

As autonomous vehicles become more ubiquitous on highways and roads, the spatial and geographic areas where traffic is policed could also shift in ways that exacerbate aggressive traffic enforcement and pretextual traffic stops.[148] For instance, if autonomous vehicles become mainstream in more affluent and middle-class communities, then law enforcement agencies could strategically place traffic patrol in neighborhoods or on roads that are known to have higher traffic flows of conventional vehicles. In turn, patrol officers could sharpen their focus on traffic enforcement against conventional vehicles as pretexts to pursue broader crime-control agendas in designated "high crime areas" with greater concentrations of people of color.[149] Officers could also use conventional vehicles as a proxy to amplify current practices of stopping and ticketing drivers who are travelling to and from localities that are known to have higher concentrations of racially and economically marginalized populations.[150]

The direction of new autonomous vehicle infrastructure is also relevant. New highways and roads exclusively designed for autonomous vehicles[151] would spatially and physically separate autonomous vehicles from traffic patrol officers looking to enforce traffic violations. Alternatively, if autonomous vehicles are given exclusive lanes on highways and roads, then traffic patrol could focus their attention on driving lanes that only include conventional vehicles.[152] Officers could then use conventional vehicles as a direct or indirect proxy to stop and ticket drivers and passengers from racially and economically marginalized populations at higher rates.[153]

* * *

comprehensive analysis of intrusions stemming from police questioning of motorists during traffic stops, see Jeannine Bell, *The Violence of Nosy Questions*, 100 B.U. L. REV. 935 (2020).

148. *See* Novak, *supra* note 135, at 69 ("[P]atterns of organizational deployment may contribute to differential traffic stops of minorities.").

149. *See, e.g.*, Roh & Robinson, *supra* note 3, at 137 (presenting study findings "imply[ing] that racial disparity at the level of individual stops may be substantially explained by differential policing strategies adopted for different areas based on who resides in those areas"); *see also* James E. Wright II, Dongfang Gaozhao & Meagan A. Snow, *Place Plus Race Effects in Bureaucratic Discretionary Power: An Analysis of Residential Segregation and Police Stop Decisions*, 44 PUB. PERFORMANCE & MGMT. REV. 352, 352 (2020) (presenting findings of traffic enforcement in Minneapolis, Minnesota, finding that "majority African American areas of high segregation have 40% more vehicle or person searches than other parts of the city").

150. In this regard, autonomous vehicles could amplify existing police practices of directed patrol. *See* Christopher Barnum & Robert L. Perfetti, *Race-Sensitive Choices by Police Officers in Traffic Stop Encounters*, 13 POLICE Q. 180, 185 (2010) ("Directed patrol is a police deployment technique that increases the odds the police will come into contact with minority members. This can result from geographic, temporal, or organizational factors.").

151. *See supra* note 79 and accompanying text (discussing "smart" highways for autonomous vehicles).

152. *See supra* note 77 and accompanying text (discussing reserving exclusive lanes on roads and highways for autonomous vehicles).

153. *See supra* note 150 and accompanying text.

In sum, autonomous vehicles are likely to narrow the universe of vehicles that commit traffic violations and, in turn, transform the spatial and geographic boundaries of where traffic laws are enforced in a mixed-traffic regime. In so doing, autonomous vehicles could give rise to new layers of problems involving pretextual traffic stops and aggressive traffic policing against drivers and passengers in conventional vehicles. Most at risk are communities of color and other marginalized groups that are vulnerable to overpolicing and overcriminalization in today's driving regime. Having developed these points, the remainder of this Article considers possibilities for reform.

III. REFORMS

This part explores potential law and policy reforms for achieving racial and economic justice in traffic enforcement and policing against drivers and passengers in conventional vehicles in a mixed-traffic regime. Section III.A examines police reforms. Section III.B focuses on transportation law and policy.

A. *Policing*

The new challenges that autonomous vehicles pose for fairness and equality in the traffic domain are not simply repeats of today's problems. Rather, autonomous vehicles could add layers of structural unfairness and inequality into the police regulation of traffic by enabling a growing number of vehicle owners and users from more privileged positions of race and class to be shielded from police enforcement of traffic laws.[154]

As a first step, organized efforts to collect and disseminate data on traffic stops as a means to curb racial profiling must consider how the introduction of autonomous vehicles affects racial profiling and disparities in the traffic space. Currently, approximately twenty states have laws that are intended to address racial profiling through data collection and dissemination.[155] Data collected under these statewide initiatives, as well as local efforts in states that do not have such laws, must provide enough information to allow researchers to identify and study changes in traffic policing patterns as autonomous vehicles become increasingly mainstream.

154. *See supra* Part II.

155. *See It's Time To Start Collecting Stop Data: A Case for Comprehensive Statewide Legislation*, POLICING PROJECT (Sept. 30, 2019), https://www.policingproject.org/news-main/2019/9/27/its-time-to-start-collecting-stop-data-a-case-for-comprehensive-statewide-legislation [https://perma.cc/5MD4-XYVZ] ("Currently there are 19 states that (for the most part) mandate collection of data on every law enforcement initiated traffic stop . . . ."); *State Trends in Law Enforcement Legislation: 2014–2017*, NAT'L CONF. ST. LEGISLATURES (Sept. 24, 2018), https://www.ncsl.org/research/civil-and-criminal-justice/state-trends-in-law-enforcement-legislation-2014-2017.aspx [https://perma.cc/2DXQ-T8BF] ("At least 21 states collect demographic information for person's whose vehicles are stopped by police.").

Policing scholars and researchers might have to develop new empirical models and methods to track those changes. Here, the federal government could play an important role by awarding grants for scholars and researchers to pursue this line of research.[156] Already, the National Institute of Justice has awarded grants for researchers to identify and combat vulnerabilities of autonomous vehicle computer systems to cyber threats and to host workshops on the public safety scenarios that law enforcement officers will likely face in the advent of autonomous vehicles.[157]

Beyond data collection and dissemination, deeper structural reforms that reorient the role of police in the traffic space will be even more important in the advent of autonomous vehicles. If piecemeal constitutional or statutory interventions are inadequate to tackle persistent race- and class-based injustices in today's driving system,[158] then we can only expect that those approaches will be even less effective to tackle these new challenges on the horizon. Legal scholars have already identified a need to rethink police involvement in routine traffic enforcement and have advanced specific ideas for reform.[159] These calls are part of a broader growing scholarly and public conversation about the proper role of police and concerns about the vast scope of the police function.[160]

In other work, I propose removing police from routine traffic enforcement.[161] Under that proposal, jurisdictions would create and redelegate the bulk of traffic enforcement to newly created public, nonpolice agencies

156. For instance, the National Institute of Justice ("NIJ"), a wing of the U.S. Department of Justice, "awards grants and cooperative agreements for various research, development, and evaluation projects; and fellowship programs." *Funding & Awards*, NAT'L INST. JUST. (June 17, 2019), https://nij.ojp.gov/funding [https://perma.cc/9N6F-DUS4].

157. NAT'L SCI. & TECH. COUNCIL & U.S. DEP'T OF TRANSP., *supra* note 9, at 16.

158. Scholars have described how Fourth Amendment protections in traffic stop contexts have become diluted over time. *See* David A. Harris, *Car Wars: The Fourth Amendment's Death on the Highway*, 66 GEO. WASH. L. REV. 556, 556 (1998) ("Indeed, it is no exaggeration to say that in cases involving cars, the Fourth Amendment is all but dead."). For a comprehensive analysis of the dilution of Fourth Amendment protections on roads and highways, see generally LaFave, *supra* note 143; Lewis R. Katz, *"Lonesome Road": Driving Without the Fourth Amendment*, 36 SEATTLE U. L. REV. 1413 (2013).

159. *See, e.g.*, Joh, *Discretionless Policing*, *supra* note 25, at 216 (discussing automating traffic enforcement); SARAH A. SEO, DATA FOR PROGRESS, THE JUST. COLLABORATIVE INST., A PATH TO NON-POLICE ENFORCEMENT OF CIVIL TRAFFIC VIOLATIONS 5 (2020), https://tjcinstitute.com/wp-content/uploads/2020/09/non-police-enforcement-of-civil-traffic-violations.pdf [https://perma.cc/3MSU-7TGM] (discussing non-police enforcement of civil traffic violations); Jordan Blair Woods, *Traffic Without the Police*, 73 STAN. L. REV. 1471, 1471 (2021); Ekow N. Yankah, *Pretext and Justification: Republicanism, Policing, and Race*, 40 CARDOZO L. REV. 1543, 1625–28 (2019) (discussing the separation of removing traffic monitoring powers from traditional police powers).

160. *See, e.g.*, ALEX S. VITALE, THE END OF POLICING 27 (2017) ("[W]hat we really need is to rethink the role of police in society."); Barry Friedman, *Disaggregating the Policing Function*, 169 U. PA. L. REV. 925, 926 (2021).

161. Woods, *supra* note 159, at 1477.

(called "traffic agencies").[162] Traffic agencies would operate wholly independently of the police and hire their own public employees (called "traffic monitors") to conduct and oversee routine traffic enforcement. Traffic monitors would enforce traffic laws through in-person traffic stops and handle all aspects of traffic enforcement that jurisdictions decide to automate.[163]

The push for reforms to remove police from traffic enforcement has also grown in the wake of protests and social mobilization against police violence.[164] For instance, in July 2020, the City of Berkeley, California, voted in favor of a proposal that would be the first in the country to remove police from conducting traffic stops as part of a comprehensive plan to reimagine public safety.[165] The proposal directs the city to create a Department of Transportation staffed by unarmed civil servants who would be in charge of enforcing traffic laws.[166]

Other jurisdictions have recently enacted reforms that limit police-initiated traffic stops for certain driving offenses without going so far as to create new public agencies to handle traffic enforcement. For instance, in 2020, the Commonwealth of Virginia passed a new law that prohibits officers from conducting traffic stops based on various low-level equipment violations including faulty lighting, defective equipment, window tints, and noisy exhaust systems.[167] The Virginia law seeks to eliminate racial profiling during traffic stops.[168] In another example, in 2021 the mayor of the City of Philadelphia

162. *Id.* at 1488–515 (developing a new framework for traffic enforcement that redelegates the bulk of traffic enforcement tasks to nonpolice agencies).

163. To maximize the potential of these structural reforms to achieve fairness and equality in traffic enforcement, the framework includes two additional law and policy reforms: (1) reevaluating the breadth and imprecision of traffic codes so that traffic law and enforcement only focuses on driving behaviors that pose an imminent public safety threat, and (2) reducing financial and professional incentives that contribute to aggressive and biased traffic enforcement (namely, restructuring traffic fines and fees systems and prohibiting traffic ticket issuances as a measure of professional performance). *Id.* at 1479, 1507–15.

164. *See, e.g.*, Julianne Cuba, *Campaign To Remove NYPD from Traffic Enforcement Gains Steam*, STREETSBLOGNYC (June 25, 2020), https://nyc.streetsblog.org/2020/06/25/campaign-to-remove-nypd-from-traffic-enforcement-gains-steam/ [https://perma.cc/K8GU-75KV] (discussing efforts to remove NYPD from traffic enforcement); Beverly White, *Could Routine Traffic Stops Be Conducted Without Armed Police Officers?*, NBC L.A. (June 30, 2020, 11:54 PM), https://www.nbclosangeles.com/news/local/could-routine-traffic-stops-be-conducted-without-lapd/2388942/ [https://perma.cc/B89K-NLUF] (discussing proposal to have the Department of Transportation, and not police, handle traffic stops in the city of Los Angeles).

165. Kellen Browning & Jill Cowan, *How Berkeley Could Remove the Police from Traffic Stops*, N.Y. TIMES (July 9, 2020), https://www.nytimes.com/2020/07/09/us/berkeley-ca-police-department-reform.html [https://perma.cc/F3LF-FG9Y (dark archive)]; Rachel Sandler, *Berkeley Will Become 1st U.S. City To Remove Police from Traffic Stops*, FORBES (July 15, 2020, 8:22 PM), https://www.forbes.com/sites/rachelsandler/2020/07/14/berkeley-may-become-1st-us-city-to-remove-police-from-traffic-stops/#757f789970fa [https://perma.cc/T7TH-LMCE (dark archive)].

166. Browning & Cowan, *supra* note 165; Sandler, *supra* note 165.

167. H.B. 5058, 161st Gen. Assemb., Spec. Sess. I (Va. 2020).

168. Simone Weichselbaum, Emily R. Siegel & Andrew Blankstein, *Police Face a 'Crisis of Trust' with Black Motorists. One State's Surprising Policy May Help.*, NBC NEWS (Oct. 7, 2021, 5:00 AM),

signed an executive order implementing the city's recently passed "Driving Equality" bill, which effectively bans police from making traffic stops based on certain low-level traffic violations (called "secondary violations" under the new law).[169] Officers must observe a more serious driving offense (called "primary violations" under the new law) to conduct a traffic stop and only then can they issue a citation for a low-level traffic violation.[170] Proponents hailed the new legislation as an important step to reduce racial inequality and discrimination during traffic stops in the city.[171]

Looking to the growth of autonomous vehicles for additional reasons to reevaluate the role of police in the traffic space also makes sense given the history behind why police first became involved in traffic enforcement. Professor Sarah Seo's historical work illustrates how police became involved in traffic law enforcement a century ago with the rise of the mass production of the automobile.[172] Until then, movement on highways and roads was largely self-regulated.[173] As fast-moving cars became more common on highways and roads, self-regulation was no longer a desirable or feasible approach for maintaining traffic safety.[174] Seo explains that public opinion shifted to view bad driving, especially when it resulted in serious injuries, as a threat to general public safety.[175] In turn, governments expanded traffic codes with new moving and nonmoving traffic violations (for instance, speeding and driver's license restrictions).[176] The proliferation of traffic laws not only rendered anyone who

https://www.nbcnews.com/news/us-news/traffic-stops-are-flashpoint-policing-america-reformers-are-winning-big-n1280594 [https://perma.cc/7TPN-52QJ].

169. PHILADELPHIA CODE § 12-1703(3) (2021) ("[A] police officer or other law enforcement officer may initiate a motor vehicle stop for a secondary violation observed within the City of Philadelphia only where there is a simultaneously-observed primary violation for which an officer, at their discretion, could issue a citation."). "Secondary violations" include traffic violations involving registration plate placement, lighting equipment, minor windshield obstructions, bumper damage, and driving without proper registration or inspection certificates. *Id.* § 12-1702(2).

170. *Id.* § 1703(3).

171. Tim Stelloh, *Philadelphia To Become First Big City in U.S. To Ban Minor Traffic Stops*, NBC NEWS (Nov. 1, 2021, 4:14 PM), https://www.nbcnews.com/news/us-news/philadelphia-become-first-big-city-u-s-ban-minor-traffic-n1282911 [https://perma.cc/WVY3-8K9T].

172. *See generally* SARAH A. SEO, POLICING THE OPEN ROAD: HOW CARS TRANSFORMED AMERICAN FREEDOM (2019) (offering a comprehensive legal and historical analysis of how the mass production and growth of the automobile had transformative effects on policing, criminal procedure, and freedom in the United States).

173. *Id.* at 25 ("Even in the cities, the flow of movement on streets and highways was largely self-regulated.").

174. *Id.* at 26 ("Nineteenth-century self-regulation was unsuited for the sudden influx of thousands of fast-moving cars on the public roads.").

175. *Id.* at 33 ("[T]he consensus view among laypeople was that bad driving afflicted the entire motoring population."); *id.* at 30 ("[M]any traffic violations, especially when they resulted in tragedy, did incite righteous outrage.").

176. *Id.* at 26 ("Local governments responded swiftly by enacting laws and more laws. In addition to speed limits and license requirements, new regulations mandated safety equipment, like nonglaring headlights, rearview mirrors.").

drove a motor vehicle a potential lawbreaker, but also invited increased reliance on the police to enforce those laws.[177] Police involvement in the traffic domain expanded over time, and the relationship between traffic and criminal law enforcement became more pronounced.[178]

As autonomous vehicles become more ubiquitous, an increasing number of vehicles will be capable of avoiding traffic violations and motor vehicle crashes.[179] Consequently, the public safety concerns that initially justified creating and maintaining a large role for police in traffic enforcement will increasingly lose force with the growth of autonomous vehicles. As those justifications lose force, however, police regulation of traffic could more acutely and unfairly target the very populations that are already overpoliced and overcriminalized in the traffic space.[180] Unpacking these competing currents reveals why structural police reforms in the area of traffic enforcement will be even more necessary in a mixed-traffic regime where autonomous vehicles and conventional vehicles share the road.

B. *Transportation Law and Policy*

The growth of autonomous vehicles also prompts novel questions about how transportation law and policy could be used in a mixed driving regime to address gaps that render conventional vehicle occupants at greater risk of police contact through traffic enforcement. As explained below, there are several possible directions that these law and policy innovations could take. These innovations will be especially important if police retain their current role in traffic enforcement vis-à-vis conventional vehicles in a mixed-traffic regime.

Starting from the assumption that private ownership will be a popular model of autonomous vehicle ownership, one possible future approach is to accelerate the growth of privately-owned autonomous vehicles by making the technology more affordable to individual consumers through government investment.[181] Without proactive government intervention, higher-income

177. *Id.* at 27 ("The proliferation of traffic laws turned everyone who drove a car into a lawbreaker."); *id.* at 58 ("When such laws lacked in inherent moral force compelling obedience, and when efforts to endow those laws with a moral obligation to obey proved inadequate, reliance on the police appeared to be the only option left.").

178. *Id.* at 109 ("As crime became more mobile, traffic and criminal law enforcement began to overlap.").

179. Geistfeld, *A Roadmap for Autonomous Vehicles*, *supra* note 15, at 1616 (noting "the substantial reduction in the number of crashes" as "autonomous vehicles become more common on the roadways").

180. *See supra* Part II.

181. Donald G. Gifford, *Technological Triggers to Tort Revolutions: Steam Locomotives, Autonomous Vehicles, and Accident Compensation*, 11 J. TORT L. 71, 140 (2018) ("Society may legitimately decide that because of the extremely significant overall improvement in safety resulting from autonomous vehicles and other positive aspects of autonomous vehicles, the development of the autonomous-vehicle technology should be subsidized."); Luo et al., *supra* note 48, at 226 (discussing the sensibility of "provid[ing] subsidies to promote the early adoption of AVs"). Related to this point, researchers have

households, especially in car-dependent areas, will be in the strongest position to enjoy early access to autonomous vehicles and reap the benefits of reduced police contact through traffic enforcement.[182] To address these problems, government subsidies could be employed in ways that make autonomous vehicles more accessible in lower-income communities, especially in car-dependent areas with higher concentrations of minority populations that are overpoliced and overcriminalized in the traffic space.

Subsidies could also be used to create new programs that encourage lower-income households to trade in older, conventional vehicles for newer, autonomous vehicles.[183] Prior automobile subsidy programs offer a possible starting point. When car sales dropped dramatically after the financial crisis in 2008, the federal government instituted the Car Allowance Rebate System (also known as "cash for clunkers").[184] The program allocated $3 billion to help stimulate new car sales and to encourage consumers to trade in their older vehicles and purchase newer, more fuel efficient vehicles.[185] Depending on the type of car purchased and the difference in fuel efficiency between the older and newer vehicle, consumers received between $3,500 and $4,500 credit in the form of a voucher or reduced purchase price from new car dealers.[186] To stimulate the growth of autonomous vehicles, the federal government could institute a similar program that offers owners of conventional vehicles a substantial credit in the form of a voucher or reduced purchase price to buy newer, autonomous vehicles.[187]

argued for creating consumer subsidies to make autonomous taxi services more affordable for low-income people. *See* Ashley Nunes, Sam Harper & Kristen D. Hernandez, *The Price Isn't Right: Autonomous Vehicles, Public Health, and Social Justice*, 110 AM. J. PUB. HEALTH 796, 797 (2020) (advocating for "creat[ing] consumer subsidies for low-income individuals using autonomous taxi services"). Here, it is important to recognize that some legal scholars have critiqued the use of law to subsidize driving. *See, e.g.*, Gregory H. Shill, *Should Law Subsidize Driving?*, 95 N.Y.U. L. REV. 498, 577 (2020) (stressing that "[r]ules from virtually every field of law that codify subsidies for driving, including dangerous driving, should be repealed").

181. *See supra* Part II.

182. *See supra* Part II.

183. *See* Abbott, *supra* note 30, at 32–33.

184. TED GAYER & EMILY PARKER, CASH FOR CLUNKERS: AN EVALUATION OF THE CAR ALLOWANCE REBATE SYSTEM 1–2 (2013), https://www.brookings.edu/wp-content/uploads/2016/06/cash_for_clunkers_evaluation_paper_gayer.pdf [https://perma.cc/R4CW-UFBU]. It is important to note that scholars and commentators have critiqued the effectiveness of the "cash for clunkers" program. *See id.* at 12; *see also* Atif Mian & Amir Sufi, *The Effects of Fiscal Stimulus: Evidence from the 2009 Cash for Clunkers Program*, 127 Q.J. ECON. 1107, 1108 (2012). To be clear, I am merely discussing the program here as an example that offers a useful starting point for designing subsidy programs that make autonomous vehicles more affordable to conventional vehicle users. I am not arguing that autonomous vehicle subsidy programs should be exact mirrors of the "cash for clunkers" program.

185. GAYER & PARKER, *supra* note 184, at 2.

186. *Id.*

187. Abbott, *supra* note 30, at 32–33.

The previous analysis illustrated why narrowing gaps in ownership and access to privately-owned autonomous vehicles along the lines of race and class can engender important equality benefits for traffic enforcement and policing. There are other potential benefits to this acceleration, however, that do not immediately involve policing and traffic stops. For instance, scholars and researchers describe that the full spectrum of societal benefits that autonomous vehicles can offer will only be realized if there are a sufficient number of autonomous vehicles on the road.[188] One estimate suggests that motor vehicle accidents cost the U.S. economy over $340 billion each year in economic costs (for instance, increased insurance premiums, medical costs, loss of work and income, and legal costs) and noneconomic costs (for instance, death and injuries).[189] It further estimated that fully replacing conventional vehicles with autonomous vehicles would save the U.S. economy over $306 billion each year.[190]

In the nearer term, government subsidies could also be used to narrow gaps between autonomous and conventional vehicles in their capabilities of avoiding traffic violations.[191] For instance, subsides could encourage auto manufacturers to build active safety systems or driver-assistance systems into newer conventional vehicles at affordable prices. Those improvements would increase the capabilities of newer conventional vehicles to avoid committing traffic violations as society progresses towards autonomous vehicles and older, conventional vehicles phase out. In turn, there would be fewer opportunities for police to initiate traffic stops on conventional vehicles as society transitioned into a mixed-traffic regime.

One example that illustrates how a move in this direction is possible in the near-term comes from the $1 trillion infrastructure bill that President Biden recently signed into law (the Infrastructure Investment and Jobs Act).[192] The Act includes a number of provisions to improve vehicle safety, including a mandate that could go into effect by 2025 requiring auto manufacturers to equip

188. Aaron Edelmann, Stefan Stümper & Tibor Petzoldt, *Cross-Cultural Differences in the Acceptance of Decisions of Automated Vehicles*, 92 APPLIED ERGONOMICS 103346, Jan. 2021, at 1, 1 (noting that "AVs [automated vehicles] have to be attractive and widely accepted" in order to fulfill their expectations "to bring upon many benefits"); Luo et al., *supra* note 48, at 226 ("[A]fter there are a sufficient number of such vehicles in the traffic stream, many benefits can be realized.").

189. *Driverless Cars Set To Save World Economies Billions—World Study*, GLOB. POSITIONING SPECIALISTS, https://www.gps.com.au/fleet-management-solutions/driverless-cars-set-to-save-world-economies-billions-world-study [https://perma.cc/NG2K-U4K8].

190. *Id.*

191. *See* Yong Liu, Bing-ting Quan, Qian Xu & Jeffrey Yi-Lin Forrest, *Corporate Social Responsibility and Decision Analysis in a Supply Chain Through Government Subsidy*, 208 J. CLEANER PROD. 436, 437 (2019) ("Government efforts to direct business behaviors toward certain socially desirable outcomes take a variety of forms and approaches. One approach that has been gathering substantial support in recent years is to provide subsidies.").

192. H.R. 3684, 117th Cong. (2021) (enacted).

new vehicles with "advanced drunk and impaired driving prevention technology."[193] The congressional findings in support of the mandate stress the frequency of alcohol-impaired driving fatalities and the economic costs that stem from alcohol-impaired driving.[194] Under the Act, qualifying technology includes, but is not limited to, systems that can passively monitor driving behaviors to identify impairment and "prevent or limit motor vehicle operation if an impairment is detected."[195] In line with this vision, several auto manufacturers are already installing infrared cameras in vehicles that track driver attentiveness and intervene with semiautomated driver-assist systems (including hazard lights, speed reduction, and halting or pulling over the vehicle) when warning driving behaviors are detected.[196]

One criticism of using government investment to accelerate the growth of privately-owned autonomous vehicles focuses on the potentially negative environmental implications of encouraging this model of autonomous vehicle ownership. Although more research is needed, researchers argue that one of the most promising potential environmental benefits of automated driving technology is its ability to move transportation systems away from heavy reliance on privately owned vehicles.[197] From this perspective, rather than encouraging the growth of privately owned autonomous vehicles, government investment could be used instead to expand access to reliable public transportation or affordable car sharing services, especially in car-dependent areas with higher concentrations of minority populations that are over-policed and over-criminalized in the traffic space.

Calls for expanding access to reliable public transportation services are far from new. For instance, transportation scholars and advocates have long stressed that reliable public transportation is essential for many low-income people, particularly in rural and car-dependent areas, to access jobs, health care, education, and other vital aspects of everyday life.[198] They have also identified various factors that inhibit access to public transportation in rural and other car-dependent areas, including lack of government investment, travel time, weather, supply constraints, and costs.[199]

193. *Id.* § 24220(c).

194. *Id.* § 24220(a).

195. *Id.* § 24220(b)(1)(A)(ii).

196. Eleonor Segura, *Your Next Car Could Include Newly Required Drunk Driving Prevention Tech*, MOTORTREND (Nov. 11, 2021), https://www.motortrend.com/news/anti-drunk-driving-technology-mandated-infrastructure-bill/ [https://perma.cc/RL7S-QQ9J] ("General Motors, BMW, and Nissan have already started installing infrared cameras that monitor driver behavior. These cameras track driver attentiveness and use semi-automatic driver-assist systems.").

197. Morteza Taiebat, Austin L. Brown, Hannah R. Safford, Shen Qu & Ming Xu, *A Review on Energy, Environmental, and Sustainability Implications of Connected and Automated Vehicles*, 52 ENV'T SCI. & TECH. 11449, 11450, 11460 (2018).

198. Jill Hough & Ali Rahim Talequani, *Future of Rural Transit*, 21 J. PUB. TRANSP. 31, 34 (2018).

199. *Id.* at 36.

If the growth of privately-owned autonomous vehicles exacerbates race- and class-based injustices in conventional traffic policing, then those injustices might add new layers to ongoing law and policy conversations about the need for expanding reliable public transportation choices within communities, especially in rural and other car-dependent areas. Here, technology could hold promise. For instance, government investment could bolster efforts to integrate automated technology within public transit systems to narrow access gaps in rural and other car-dependent areas.[200] Moving in this direction, however, requires stakeholders to have a broader point-of-view than merely equating "smart" public transportation with urban public transportation in the future.[201]

CONCLUSION

Although many questions remain open about the direction of autonomous vehicle technology, it is almost certain that when autonomous vehicles are available for purchase on the market, they will share the road with conventional, human-controlled vehicles for some period of time.[202] This Article offered a detailed portrait of the potentially negative systemic effects of autonomous vehicles on racial and economic justice in traffic enforcement and policing against conventional vehicles that remain on the road in a mixed-traffic regime. The analysis made an important descriptive contribution to the scholarly literature by drawing on multiple sources (transportation data, market research, and historical evidence) to explain why the growth of autonomous vehicles could give rise to new layers of problems involving pretextual traffic stops and aggressive traffic policing against conventional vehicles. Most at risk are people of color and other marginalized communities that are already over-policed and over-criminalized in today's driving regime. To address these challenges on the horizon, this Article normatively illustrated why values of fairness and equality

200. Jonas Meyer, Henrik Becker, Patrick M. Bösch & Kay W. Axhausen, *Autonomous Vehicles: The Next Jump in Accessibilities?*, 62 RSCH. TRANSP. ECON. 80, 90 (2017) (presenting study findings predicting that rural public transportation can profit more from shared autonomous vehicle fleets than urban areas); Jan Schlüter, Andreas Bossert, Phillipp Rössy & Moritz Kersting, *Impact Assessment of Autonomous Demand Responsive Transport as a Link Between Urban and Rural Areas*, 39 RSCH. TRANSP. BUS. & MGMT. 100613, 2021, at 1, 2 ("Technological progress might not only allow for a higher quality of services in urban areas but also for an increase in the quantity of services provided outside the urban core."); *see also* Fredrik Pettersson & Jamil Khan, *Smart Public Transport in Rural Areas: Prospects, Challenges and Policy Needs*, *in* SHAPING SMART MOBILITY FUTURES: GOVERNANCE AND POLICY INSTRUMENTS IN TIMES OF SUSTAINABILITY TRANSITIONS 187, 194 (Alexander Paulson & Claus Hedegaard Sorensen eds., 2020) ("Given that a significant share of the cost for current public transportation services is allocated to labour, there is a theoretical potential that AVs [autonomous vehicles] could reduce the cost of services in low demand contexts.").

201. Sebastian Imhof, Jonas Frölicher & Widar von Arx, *Shared Autonomous Vehicles in Rural Public Transportation Systems*, 83 RSCH. TRANSP. ECON. 100925, July 2020, at 1, 1 (noting that "studies on the implementation of autonomous vehicles in the public and private transportation system show a high concentration on urban areas").

202. Abraham & Rabin, *supra* note 5, at 131.

in policing must be considered ex ante and considered in the early design and development of autonomous vehicles. This perspective strengthens existing calls for reimagining public safety in the area of traffic enforcement and underscores a need for law and policy reforms that specifically address racial and economic justice in the advent of autonomous vehicles.

APPENDIX

The table below presents the types of violations and respective number of citations for each traffic violation category included in the aggregated data for the 14,163,404 traffic tickets issued in New York State between 2013 and 2017 (the four most recent complete years of data).[203]

Traffic Violation Category	Traffic Violation Type	Number of Citations
Moving (Non-Seatbelt)	SPEED IN ZONE	1,438,817
Moving (Non-Seatbelt)	DISOBEYED TRAFFIC DEVICE	1,047,136
Moving (Non-Seatbelt)	SPEED OVER 55 ZONE	650,177
Moving (Non-Seatbelt)	OPERATING MV MOBILE PHONE	515,308
Moving (Non-Seatbelt)	FLD TO STOP AT STOP SIGN	441,460
Moving (Non-Seatbelt)	SPEED IN ZONE 11-30	429,316
Moving (Non-Seatbelt)	OPER MV WHILE USING PORTABLE ELEC DEV	364,126
Moving (Non-Seatbelt)	IMPROPER SIGNAL	221,879
Moving (Non-Seatbelt)	IMPROPER TURN	166,059
Moving (Non-Seatbelt)	MOVED FROM LANE UNSAFELY/WEAVING	160,823
Moving (Non-Seatbelt)	NYC REDLIGHT	156,595
Moving (Non-Seatbelt)	FLD YIELD PEDEST NYC	143,968
Moving (Non-Seatbelt)	DRIVING WHILE INTOXICATED	127,334
Moving (Non-Seatbelt)	PASSED RED SIGNAL	121,860
Moving (Non-Seatbelt)	FOLLOWING TOO CLOSELY	96,835
Moving (Non-Seatbelt)	SPEED NOT REASONABLE AND PRUDENT	83,347
Moving (Non-Seatbelt)	DRIVING W/.08 OF 1 PERCENT OF ALCO/BLD	74,979
Moving (Non-Seatbelt)	SPD-UNPSTD 11-30 NYC	71,856
Moving (Non-Seatbelt)	FAILED TO KEEP RIGHT	58,381
Moving (Non-Seatbelt)	FLD DUE CARE FOR EMERG VEH STOPPED OR STANDING	53,036
Moving (Non-Seatbelt)	SPEEDING IN SCHOOL ZONE	49,431

203. *See supra* notes 96–105 and accompanying text.

Moving (Non-Seatbelt)	IMPROPER RIGHT TURN	47,536
Moving (Non-Seatbelt)	INSUFF TURN SIGNAL-LESS THAN 100 FEET	46,410
Moving (Non-Seatbelt)	OPERATING OUT OF CLASS	42,883
Moving (Non-Seatbelt)	DROVE ACROSS HAZARD MARKING	42,655
Moving (Non-Seatbelt)	IMPROPER OR UNSAFE TURN/WITHOUT SIGNAL	42,018
Moving (Non-Seatbelt)	SPEED IN ZONE 31+	37,962
Moving (Non-Seatbelt)	NO STOPPING/STANDING/ PARKING ON HIGHWAY	36,296
Moving (Non-Seatbelt)	CONSUMPTION/ALCOHOL IN MOTOR VEHICLE	34,059
Moving (Non-Seatbelt)	FAILED TO USE DESIGNATED LANE	34,042
Moving (Non-Seatbelt)	U-TRN BUSIN DIST NYC	31,815
Moving (Non-Seatbelt)	IMPROPER LEFT TURN ON TWO-WAY RDWY	30,572
Moving (Non-Seatbelt)	FLD TO YLD RT-OF-WAY ON LEFT TURN	27,803
Moving (Non-Seatbelt)	BACKING UNSAFELY	27,181
Moving (Non-Seatbelt)	SPEEDING IN POSTED WORK ZONE	26,909
Moving (Non-Seatbelt)	DRIVING TO LEFT OF PAVEMENT MARKINGS	26,616
Moving (Non-Seatbelt)	AGGRAVATED DWI - BLOOD ALCOHOL CONTENT .18 OR HIGH	26,133
Moving (Non-Seatbelt)	DRIVING/WRONG DIRECTION ON ONE-WAY STREET	25,855
Moving (Non-Seatbelt)	IMPROPER U-TURN	25,409
Moving (Non-Seatbelt)	FLD TO STOP SCHOOL BUS	25,064
Moving (Non-Seatbelt)	IMPROPER LEFT TURN ON ONE-WAY RDWY	22,112
Moving (Non-Seatbelt)	FAILED TO TURN AS REQUIRED	19,116
Moving (Non-Seatbelt)	FLD TO YLD RT-OF-WAY TO EMERGENCY VEHICLE	18,511
Moving (Non-Seatbelt)	IMPROPER PASSING ON RIGHT	16,493
Moving (Non-Seatbelt)	PASSED VEHICLE ON RIGHT	16,038
Moving (Non-Seatbelt)	DRIVING ON SHOULDER/LIMITED ACCESS HGWY	15,508

Moving (Non-Seatbelt)	DRIVING W/ABILITY IMPAIRED BY DRUGS	15,473
Moving (Non-Seatbelt)	FLD TO YLD RT-OF-WAY AT STOP SIGN	15,337
Moving (Non-Seatbelt)	SPEED 11-30 OVR LMT	15,071
Moving (Non-Seatbelt)	TRUCK RTE VIOLS NYC	14,584
Moving (Non-Seatbelt)	FLD TO YLD RT-OF-WAY WHEN ENTERING ROADWAY	14,370
Moving (Non-Seatbelt)	FLD TO STOP ON A STEADY RED ARROW	14,196
Moving (Non-Seatbelt)	DISOBEYED TRAFFIC DEVICE - HOV LANE	14,120
Moving (Non-Seatbelt)	OPER MV/MC/BIC W/MORE 1 EARPHONE	13,430
Moving (Non-Seatbelt)	RECKLESS DRIVING	13,220
Moving (Non-Seatbelt)	SPEED IN ZONE 1-10	13,066
Moving (Non-Seatbelt)	FLD TO YLD RT-OF-WAY TO PEDESTRIAN ON SIDEWALK	11,843
Moving (Non-Seatbelt)	SPEED-PSTD 11-30 NYC	11,804
Moving (Non-Seatbelt)	OBSTRCT TRAFF LN NYC	11,671
Moving (Non-Seatbelt)	FLD OBEY SIGNS-TBTA	11,526
Moving (Non-Seatbelt)	FLD TO YLD RT-OF-WAY AT INTERSECTION	10,840
Moving (Non-Seatbelt)	UNREASONABLE SPEED/SPECIAL HAZARDS	10,767
Moving (Non-Seatbelt)	AVOIDING TRAF DEVICE OR INTERSECTION	10,659
Moving (Non-Seatbelt)	FAILED TO USE/IMPROPER USE 4-WAY FLASHERS	10,433
Moving (Non-Seatbelt)	IMP USE BUS LANE NYC	9,970
Moving (Non-Seatbelt)	OVERLOADED VEHICLE 3 OR MORE AXLES	9,810
Moving (Non-Seatbelt)	UNAUTHORIZED USE RESTRICTED VEH ON PRKWY-COMM VEH	7,947
Moving (Non-Seatbelt)	OBSTRUCTING INTERSECTION	7,063
Moving (Non-Seatbelt)	INTERFERED W/ SAFE OPERATION	6,931
Moving (Non-Seatbelt)	SPD-UNPSTD 1-10 NYC	6,662
Moving (Non-Seatbelt)	FLD YLD PED CROSSWLK	6,368
Moving (Non-Seatbelt)	EVASION OF TOLL-TBTA	6,177
Moving (Non-Seatbelt)	DROVE OFF PAVEMENT TO PASS ON RIGHT	6,131

Moving (Non-Seatbelt)	RIDING MOTORCYCLE BETWEEN LANES	5,727
Moving (Non-Seatbelt)	DRIVING W/ABILITY IMPAIRED/ALCOHOL	5,145
Moving (Non-Seatbelt)	FLD YLD RT-OF-WAY/RT TRN AT RED SIGNAL	5,002
Moving (Non-Seatbelt)	DISOBEYED GRN ARROW	4,793
Moving (Non-Seatbelt)	PASSED FLASHING RED LIGHT	4,620
Moving (Non-Seatbelt)	OBST INTERSEC/CRSWLK	4,415
Moving (Non-Seatbelt)	FAILED TO SIGNAL AS REQUIRED	4,250
Moving (Non-Seatbelt)	DRIVING TOO SLOW	3,757
Moving (Non-Seatbelt)	DRIVING OVER DIVIDING SPACE	3,545
Moving (Non-Seatbelt)	DRIVING ON SIDEWALK	3,402
Moving (Non-Seatbelt)	BACKING ON CONTROLLED-ACCESS HGWY	3,400
Moving (Non-Seatbelt)	AGG DWAI IMPAIRED COMB DRUGS - DRUGS/ALCOHOL	3,158
Moving (Non-Seatbelt)	AGG DWI - CHILD IN VEHICLE	3,145
Paperwork (Non-License)/Plate	UNINSPECTED MOTOR VEHICLE	665,010
Paperwork (Non-License)/Plate	OPERATING W/O INSURANCE	409,102
Paperwork (Non-License)/Plate	UNREGISTERED MOTOR VEHICLE	284,280
Paperwork (Non-License)/Plate	PLATE MISSING/ INSECURE/DIRTY	228,074
Paperwork (Non-License)/Plate	OPERATING REGISTRATION SUSP/REVOKED	132,923
Paperwork (Non-License)/Plate	FLD/NOTIFY DMV CHANGE OF ADDRESS	66,131
Paperwork (Non-License)/Plate	IMPROPER PLATES	38,711
Paperwork (Non-License)/Plate	UNREG VEH > 60 DAYS	32,122
Paperwork (Non-License)/Plate	FLD/SURR/LIC/REG PLATES/REV-ART 7	31,104
Paperwork (Non-License)/Plate	FAILED TO PRODUCE INSURANCE CARD	21,255
Paperwork (Non-License)/Plate	NO/IMPROPERLY AFFIXED REG STICKER	18,228
Paperwork (Non-License)/Plate	OPER VEH W/O REG / SUSPENDED OR REVOKED DECAL	17,568

Paperwork (Non-License)/Plate	UNREGISTERED TRAILER	15,836
Paperwork (Non-License)/Plate	UNINSPECTED GT 60DAY	11,116
Paperwork (Non-License)/Plate	FAILED TO CHANGE ADDRESS/REG	8,383
Paperwork (Non-License)/Plate	PERMITTING OPERATION W/O INSURANCE	6,205
Paperwork (Non-License)/Plate	FORGED/MUTILATED INSPECTION CERT	5,278
Paperwork (Non-License)/Plate	PROVIDING INVALID INSURANCE ID CARD	4,512
Paperwork (Non-License)/Plate	UNREGISTERED MOTORCYCLE	4,494
Paperwork (Non-License)/Plate	SWITCHED TRAILER PLATES	3,527
Paperwork (Non-License)/Plate	MISUSE OF DEALER/TRANSPORTER PLATES	3,306
Paperwork (Non-License)/Plate	NO MOTORCYCLE PLATE	3,148
Equipment	SIDEWINGS/SIDEWINDOWS/NON/TRANSPARENT	461,645
Equipment	NO/INADEQUATE HEADLAMPS	354,865
Equipment	INADEQUATE OR NO STOP LAMPS	288,367
Equipment	NO/INSUFFICIENT TAIL LAMPS	146,567
Equipment	NO/INADEQUATE PLATE LAMPS	115,458
Equipment	NO/INADEQUATE MUFFLER/EXHAUST SYSTEM	104,449
Equipment	INSUFF HEADLIGHTS	58,212
Equipment	REAR SIDE WINDOWS NON/TRANSPARENT	52,655
Equipment	UNSAFE TIRE	41,492
Equipment	LIGHTING/REFLECTOR VIOLATION	36,214
Equipment	INADEQUATE OR NO STOP LAMP OR LAMPS	32,983
Equipment	NO HEADLAMPS/INCLEMENT WEATHER	27,836
Equipment	UNLAWFUL SPEEDOMETER	20,014
Equipment	FAILED TO DIM HEADLAMPS	19,472
Equipment	NO/INADEQUATE DIRECTIONAL SIGNALS	17,812

Equipment	SAFETY REGULATION VIOLATION	15,423
Equipment	IMPROPER WIPERS	13,598
Equipment	NO/ILLEGAL FRONT WINDSHIELD	11,385
Equipment	UNSAFE STARTING	8,917
Equipment	EQUIPMENT VIOLATION/INADEQUATE BRAKES	8,081
Equipment	OPERATE OUT OF IGNITION INTLK RESTRICTION	7,683
Equipment	UNAPPROVED/NO PROTECTIVE HELMET MCY	7,324
Equipment	UNAPPROVED/NO FACE SHIELD/GOGGLES- MCY	6,160
Equipment	UNAUTHORIZED LIGHTS/IMPROPER COLOR	5,474
Equipment	INADEQUATE/NO SPLASH GUARDS	5,277
Equipment	INADEQ/NO TRAFFIC HAZ WARNING LIGHTS	4,783
Equipment	INADEQUATE STEERING/BRAKES/HORN	4,450
Equipment	NO BACKUP LIGHTS	3,685
Equipment	OPERATING W/NO OR IMPROPER FRONT/REAR BUMPER	3,041
License	UNLICENSED OPERATOR	626,799
License	AGGRAVATED UNLIC OPER 3RD MISD	307,811
License	UNLICENSED GT 60DAYS	180,431
License	AGGRAVATED UNLIC OPER 3 PLUS SUSPENSION	42,571
License	AGGRAVATED UNLIC OPER-2ND DEG	29,675
License	OPER/PERMIT OPER/LIC/REG REV-ART 7	18,051
License	OPERATING IN VIOLATION OF RESTRICTIONS	17,602
License	AGGRAVATED UNLIC OPER 1ST DEGREE	14,748
License	PERMITTING UNLICENSED OPERATION	11,511
License	AGGRAVATED UNLIC OPER 2ND/PREV CONV	9,970

License	AGGRAVATED UNLIC OPER-2ND DEG-ALC	6,053
License	USE RENTED/LEASED/LOANED VEH W/O INTERLOCK	5,824
License	FACILITATING AGGRAVATED UNLIC OPER	5,367
License	FAILED TO PRODUCE LICENSE	5,144
License	AGGRAVATED UNLIC OPER 2ND MAND SUSP	4,423
License	OPER NON-SUPV FRONT SEAT OCCUPNT-DJ/MJ/PERMIT	3,407
Seatbelt	NO SEAT BELT ADULT	307,668
Seatbelt	NO LAP/SHOULDER HARNESS OR DJ VIO	249,947
Seatbelt	BACK SEAT PASS AGE 4-7 NO/IMPROPER RESTRAINT	39,343
Seatbelt	BACK SEAT PASS AGE 8-15 NO/IMPROPR SEAT BELT	32,055
Seatbelt	BACK SEAT PASS LESS THAN 4 NO/IMP RESTRAINT	25,727
Seatbelt	NO SEAT BELT PASS-VEH OPER BY DJ	23,173
Seatbelt	NO SAFETY-BELT EACH SEAT POSITION-1968	13,931
Seatbelt	NO CHILD RESTRAINT DEVICE-UNDER 4	6,491
Seatbelt	FRONT SEAT PASS AGE 8-15 NO/IMPROPR SEATBELT	5,400
Other	MOTR CARRIER OPER VEH IN VIOLATION OF SAFETY RULES	173,658
Other	LEAVING/SCENE PROPERTY DAMAGE ACCIDENT	41,009
Other	REFUSAL TO TAKE BREATH TEST	18,515
Other	IMPROP TAXI PKUP NYC	16,990
Other	FAILED TO COMPLY W/LAWFUL ORDER	14,019
Other	NO CMV ON PKWAY NYC	7,852
Other	THREW/DEPOSITED REFUSE/ETC HGWY	7,804
Other	UNAUTHORIZED USE OF NON-PASSENGER VEH- REGION 9	5,857
Other	FAILED TO COVER LOOSE CARGO	5,827
Other	UNATTENDED VEHICLE	5,235

Other	OVERWEIGHT ON REG SINGLE VEHICLE	4,978
Other	NO LOG BOOK	4,198
Other	OVERLOAD ON CONSECUTIVE AXLES	4,053
Other	PASSENGER IN VEHICLE	3,697
Other	LEAVING/SCENE PERSONAL INJURY ACCIDENT	3,554
Other	EXCESS WGHT GE 18000	3,222
Other	UNREGISTERED ATV	3,102
Other	IMPROPER TRANSPORTATION OF HAZARDOUS MATERIALS	3,079
Other	NO OVERWEIGHT/OVERSIZE PERMIT	2,971
Other	OVWGT 3/MORE AXL NYC	2,908
Unclear	FLD PRESENT DOC -NYC	37,981
Unclear	FLD/SURRENDER SUSP/REVOKED/LIC OR REG	22,909
Unclear	FAILURE TO PRODUCE LICENSE OR REGISTRATION DOCUMENTS	9,365
Visibility	DRIVERS VIEW OBSTRUCTED	105,938
Visibility	VISIBILITY DISTORTED BROKEN/DISCOLORED GLASS	46,703
Visibility	NO MIRROR/NO LEFTSIDE VIEW MIRROR	10,938
Visibility	FRONT WINDSHIELD NON/TRANSPARENT	10,254
Visibility	NO REAR OBJECT DETECTION SYSTEM DELIVERY TRUCK	5,414
Visibility	REAR WINDOW REFLECTIVE	3,716